SEPTEMBER 13, 1954

NEWS ISSUE

Electrical World

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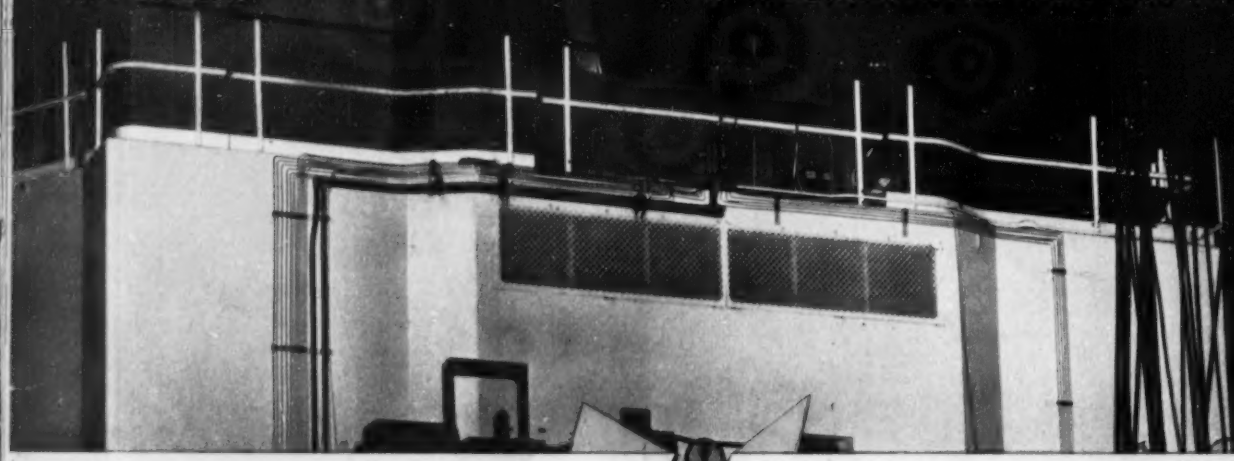
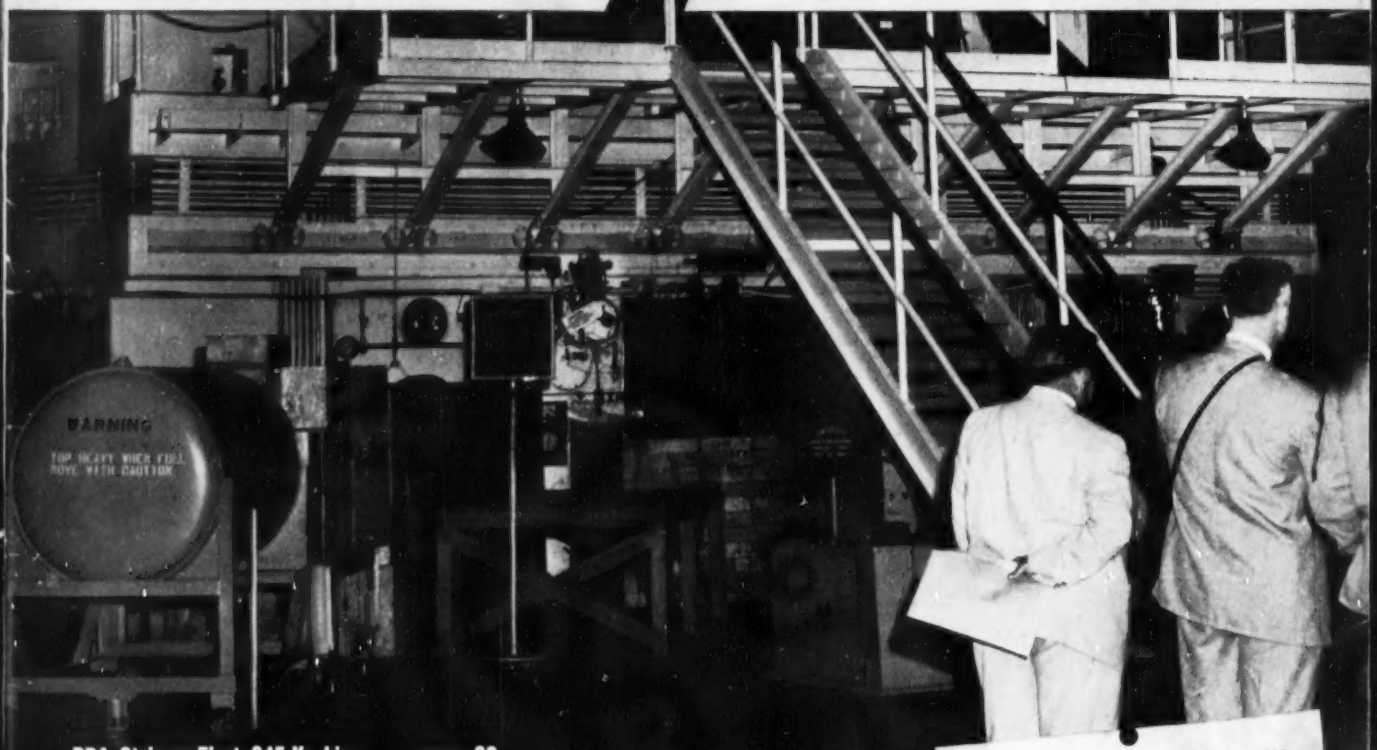


AEC Unwraps Arco Plant for the Press... page 55



BPA Strings First 345-Kv Line . . . page 30

To know Who's Who in the industry, make it a practice to read NEWS ABOUT PEOPLE . . . See page 36

E B POWER
UNIVERSITY MICROFILMS
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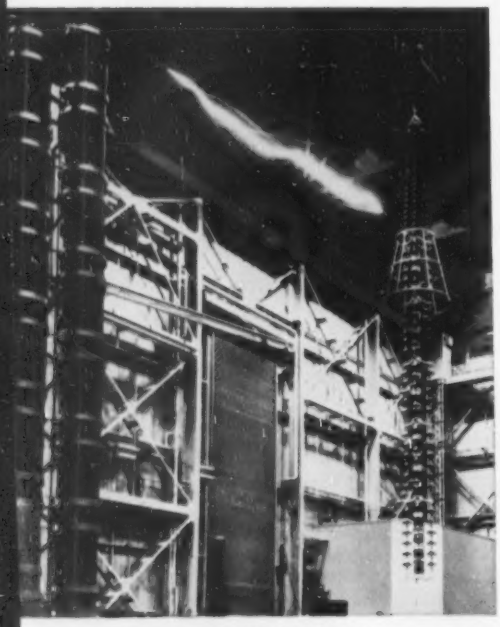
ANN ARBOR MICH

KEY ELEMENTS OF THE NEW ARRESTER, gap-unit and magnetic coil, are examined by H. M. Towne, Lightning Arrester Sales Manager at Pittsfield. Location of 4 multi-gap units and valve disks are shown in cutaway of basic 12-kv interchangeable unit (foreground) which has over 3 times discharge capacity and thermal endurance of other arresters. Greater margin of protection is given to system for surges up to 100,000 amperes.

ARE YOU OVER-INVESTING IN INSULATION?



TESTS PROVE PERFORMANCE of new Thyrite Magne-valve station arrester. Here a 330-kv arrester receives 7,500,000-volt lightning discharge during development at General Electric's High-voltage Laboratory in Pittsfield, Mass.

General Electric's new arrester extends scope of application for reduced-insulation in transformers

General Electric's recently announced Thyrite* Magne-Valve station arrester spotlights renewed attention on the potential cost savings inherent in reduced insulation levels on electric utility systems.

Many electric utilities already are taking advantage of the tremendous investment savings possible through reduced insulation levels. According to a recent industry study, all power transformers in the higher voltages of 230-kv and above were manufactured with reduced insulation. However, in the 138 and 161-kv ratings, reduced insulation was specified for only about 50% of the single-phase and 65% of the three-phase units.

General Electric's new arrester—with its outstanding protective efficiency for stroke currents even up to 100,000 amperes—has significantly lower sparkover and IR voltages than previous designs. Thus, this greater margin of protection provides assurance to all system operators, permitting wider usage of reduced insulation even on these 138 and 161-kv systems. Now a more positive approach to reduced insulation is offered to the industry with investment savings as high as 14% on power transformers alone.

More information about General Electric's revolutionary new station arrester and its application can be found in bulletin GEA-1304L. For your copy, contact your nearest Apparatus Sales office or write Section 301-257, General Electric Company, Schenectady 5, N. Y.

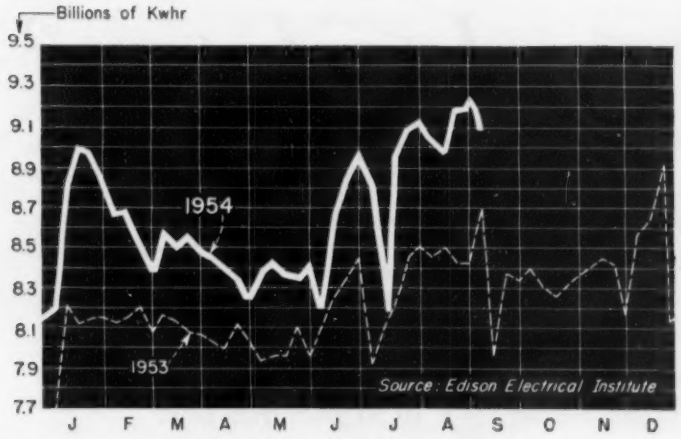
*Reg. Trade-mark of General Electric Company.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

September 13, 1954 Vol. 142, No. 11



Output Week Ended Sept. 4—9,087,000,000 Kwhr

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Sept. 4	+4.5	−13.7	−5.4	−3.7	+4.4	+16.1	+24.1	−2.0	+2.9	+4.7
Aug. 28	+8.0	−0.4	0.0	+1.0	+7.3	+20.3	+22.2	−0.3	+2.2	+3.5
Aug. 21	+9.2	+1.8	+2.8	+0.7	+11.3	+20.4	+24.5	+1.8	+2.8	+2.4

Seasonally Adjusted Index† 173.0 Week Ago 176.4 Year Ago 165.5

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load‡ (Million Kw)	June	78.0	73.8	73.0
Capacity (Million Kw)	July	96.98	95.31	86.11
Production (Billion Kwhr)	July	40.08	38.90	38.03
Hydro	July	8.76	9.59	8.75
Fuel	July	31.32	29.31	29.28
Fuel Consumption				
Coal (Million Tons)	July	9.40	9.29	9.59
Oil (Million Barrels)	July	4.45	4.29	6.34
Gas (Billion Cu Ft)	July	113.20	107.79	109.35
Sales (Billion Kwhr)	June	32.57	31.59	31.77
Residential	June	9.32	9.31	8.37
Commercial	June	6.04	5.62	5.46
Industrial	June	14.85	14.43	15.80
Other	June	2.36	2.23	2.14*
Net Income Class A & B Companies ($ Million)	June	86.76	85.46	77.52
Estimated Dec. '54 Peak ‡(Million Kw)	June	88.1	88.1	91.9
Kwhr per Residential Customer (12 Month Average)	June	2,441	2,427	2,256
Revenue per Kwhr Residential Service (12 Month Average)	June	2.71¢	2.72¢	2.76¢
Canadian Production (Billion Kwhr)	June	5.67	5.93	5.26

Business Statistics

FRB Industrial Production Index†	July	117*	124	129
Gross National Product Annual Rate ($ Billion)	2nd Qtr.	356.0	355.8	369.9
EW 4 Industry Production Index†	May	114.9	114.6	126.2
ENR Construction Cost Index††	July	135.0	130.5	126.6
BLS Consumer's Price Index	June	115.2	115.1	114.7
NEMA Insulation Materials Sales Index†	June	124	116	174
NEMA Electric Appliance Sales Index†	June	102	89	105
NEMA Household Refrig. Sales Index†	June	82	74	88

*Preliminary **Revised ‡Class 1 Systems †1947-49=100 ††1949=100

Published for 80 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Gambling on Insulators?

Shop around enough and maybe you'll run into an insulator price that sounds like a bargain.

But is it?

Will the insulators you buy today . . . at bargain prices . . . still be giving you trouble-free service 5, 10, 50 years from now?

The failure of a *single* insulator on one of your lines can shut down the entire line . . . causing loss of revenue and costly repairs . . . so you can't afford to gamble.

You're *not* gambling when you do business with an insulator manufacturer whose reputation has been built on quality for over half a century . . . and whose pioneering efforts have made possible the high insulation standards of today.

LOCKE

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GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

THE ELECTRICAL WEEK

The Issue's News Highlights . . . New era in power production was ushered in when President waved electronic wand to break ground at Shippingport, Pa., for nation's first industrial nuclear power plant.

Signing of Dixon-Yates power pact looms as AEC-TVA talks result in "meeting of the minds."

Reclamation Bureau gets $7 million to start construction on six Missouri River Basin projects.

Fire shut down Montana Power's Rainbow hydro plant near Great Falls, Mont. Transformer and generator bus were severely damaged by blaze.

"St. Lawrence development will bring to your service more hydroelectric power than all the dams in the whole TVA put together." This was statement of New York's Gov Thomas E. Dewey during his "farewell" speech Sept. 7.

Nation's electric utilities' monthly output passed 40 billion kwhr for first time in July—1.7% over previous high set last January, FPC reports . . . Electric utility output for week ended Sept. 4 was expected to be as much as 100 million kwhr under previous week's record of 9.23 billion kwhr, according to EEI preliminary estimate. New England and Long Island hurricane is blamed for much of decrease.

New record was set for gas consumption of electric utilities—127.4 billion cu ft in July—while coal and oil consumption was down from last year's levels.

Pennsylvania Superior Court has directed PUC to issue orders preventing Pennsylvania P&L from collecting $26 million from large commercial and industrial customers. PUC said it would be necessary to study court's decision before determining the next step in the case.

Mississippi PSC Chairman Alton Massey has submitted program for strengthening commission to Governor White for consideration by state legislature.

Georgia P&L rate hearing has been postponed from Sept. 16 to Sept. 23 by Georgia PSC.

Tacoma, Wash., has approved ordinances for a $146-million bond issue to build two hydro dams on Cowlitz River.

Financial . . . Ohio Power has asked SEC and PUC approval to merge Central Ohio L&P into it . . . Public Service Co of Oklahoma is planning to sell about $25 million in new securities . . . Mississippi P&L is proposing to offer 44,476 shares of new preferred stock in exchange for a like amount of $6 no par preferred now outstanding on a share-for-share basis with a cash adjustment.

Off the Washington Wire . . . Harvey Aluminum, Inc, has received a three-year FPC preliminary permit to build hydro dam on Copper River, near Valdez, Alaska, capable of turning out 7 billion kwhr annually . . . FPC also granted City of Seattle a three year preliminary permit for proposed 570,000-kw hydro project on Pend Orielle River in Washington. Transmission facilities would consist initially of two 230-kv circuits and would connect with BPA's grid system in Spokane area . . . A similar permit went to Puget Sound P&L for proposed 60,000-kw hydro project on Washington's Upper Baker River.

Army Corps of Engineers lists seven river basin projects totaling $413.5 million out of $1 billion authorized in Congress' first Omnibus Rivers and Harbors bill since 1950. Included by corps is work on the following river basins: Columbia River, Brazos River, central and southern Florida, Los Angeles County, Missouri River, San Joaquin, and West Branch Susquehanna River. New law authorizes projects, but provides no funds. Money must come later in appropriations actions.

TVA reports it had 37 generating units with combined capacity of 4.7 million kw under construction in 1954. Eleven of these, rated at 946,000 kw, were placed in service during year.

REA has approved $7.3 million loan to the Corn Belt Power Cooperative, Humboldt, Iowa, for 33,000 kw generating plant.

City of Eugene, Ore., has applied for FPC license to construct $7.2 million, 30,000-kw Beaver Marsh hydro project on Upper McKenzie River.

South Carolina Public Service Authority has succeeded in getting FPC to withdraw its order granting states and municipalities a 30% reduction in annual charges for FPC licenses pending a rehearing. Date has not yet been set.

Clarence A. Davis, Interior Department solicitor and influential figure in forming Eisenhower Administration's power policies, has taken over duties as Interior under secretary, succeeding Ralph A. Tudor.

American Chain & Cable Co has purchased virtually all the 194,800 shares of outstanding stock of Bristol Co of Waterbury, Conn., manufacturer of automatic mechanical and electronic controls.

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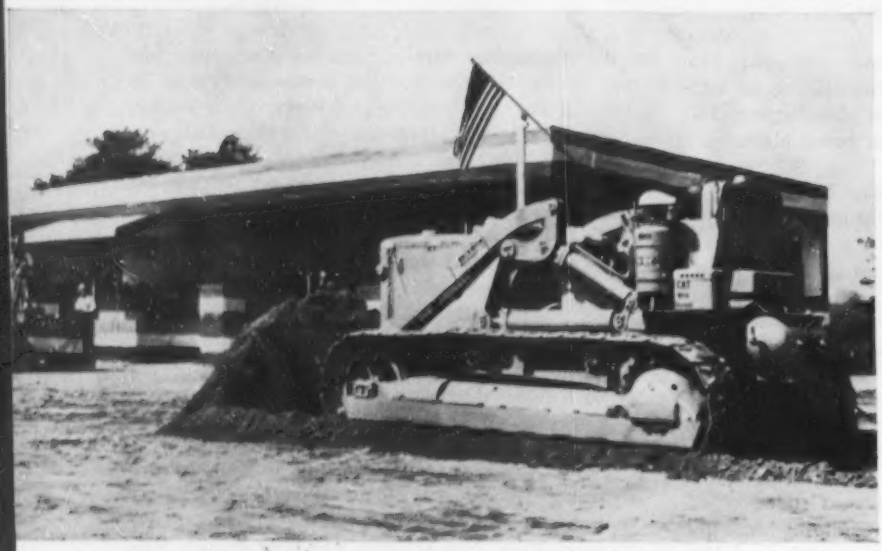


President waves an electronic wand to break ground for the nation's first industrial nuclear power plant

New Era Starts in Power Production at

With a wave of an electronic wand Labor Day, Sept. 6, President Eisenhower ushered in a new era in the atomic age and a new era in the generation of electric power. The President's motion in Denver caused a 14-ton diesel high lift to grind forward without an operator and scoop the first earth from the Shippingport, Pa., site of the 60,000-kw nuclear power plant being constructed by Duquesne Light Co and Westinghouse Electric Corp under the auspices of the Atomic Energy Commission.

Atomic Pool Formed . . . The unusual ground breaking came at the conclusion of the President's address in which he announced an agreement between the United States and several other free nations for establishment of an international agency to develop "a new atomic technology for peaceful use."

Other major announcements made by Eisenhower on the historic occasion were these:

- Formation of a reactor school to train technicians of other friendly countries in skills required for their atomic programs.
- Cooperation with countries planning to build research reactors.
- Negotiations with Belgium to build an atomic reactor in that country.
- Talks with Canada on atomic matters.

The President hailed the Shippingport PWR plant as a "historic step forward, opening for all of us new avenues to constructive employment, to prosperity and to methods for increasing the effectiveness of the American worker." He expressed confidence that the atom would become "man's mighty servant and tireless benefactor."

NOTABLES at ground breaking ceremonies at Shippingport included (l to r) W. Sterling Cole, chairman of Joint Congressional Committee on Atomic Energy; Gwilym A. Price, president of Westinghouse; Lewis L. Strauss, AEC chairman; and Philip A. Fleger, Duquesne Light chairman

'Pioneer Venture' . . . Speaking at the plant site, Rear Admiral Lewis Strauss, chairman of AEC, told 1,400 spectators that the PWR project is "more fundamentally a pioneer venture than the first railroad to penetrate the West or the first airline to span the continent." He praised the cooperative participation of industry in exploring nuclear power.

This event, continued Strauss, "will surely project its effects into the remotest future for, as we turn the sod for this great new enterprise of the

Shippingport

peaceful atom, we are also breaking ground in the area of international friendship and cooperation.

"Men of many friendly nations in the days to come will be welcomed to this place where we are now standing —to study, to observe and to carry home with them the benefits of our technology, devoted solely to the arts of peace."

Delay in starting construction of atomic power plants was attributed to Soviet policies by Rep W. Sterling Cole, chairman of the Joint Congressional Committee on Atomic Energy. He lauded the work of AEC, the free enterprise of Duquesne Light, and the willingness of Westinghouse to build the peacetime reactor.

Duquesne's board chairman Philip A. Fleger called Shippingport a venture "to advance the use of atomic power — through electricity — and thereby promote the well being of all the people."

Westinghouse Pres Gwilym Price suggested that the new plant "may be the first dawning of the new age of plenty."

Project Costs . . . AEC is providing the reactor and carrying most of the research and development costs, Strauss pointed out. It was indicated that this share might reach $33 million. Duquesne's investment in the plant was estimated at $9 to 10 million in addition to its $5 million contributed toward the reactor. Completion of the nuclear power plant is scheduled for 1957.

Westinghouse will build the nuclear reactor part of the new plant under contract with AEC. Duquesne will construct the generating part of the plant at its own expense and will operate the completed reactor for AEC, paying the commission for the steam generated by the reactor.

Power generated by the nuclear reactor will be more costly than that produced by conventional means. Duquesne consumers, however, will not pay higher rates for the power they will receive from the nation's first nuclear-fueled power plant.

Plant site at Shippingport covers 400 acres. Shippingport is 25 miles northwest of Pittsburgh.

This Is How the Electronic Wand Works

President Eisenhower used a five-pound plastic rod with a zirconium handle in Denver, Colo., to start the big power shovel at Shippingport, Pa. At the tip of the rod was a plastic ball containing tiny bits of polonium and beryllium, which emitted neutrons at a harmless rate. As the President moved the wand close to the cabinet about the size of a TV console, the neutrons emitted from the rod struck bits of uranium in a neutron counter on the cabinet. The counter recorded these fissions and a pointer moved from left to right, tripping a relay on the right. This shut off an electric current that had been humming continuously over a special telephone line from Denver to Shippingport.

This interruption operated another relay at Shippingport where the master control station near the power shovel operated automatically the shovel with air cylinders connected to its operating levers.

Westinghouse Electric Corp felt that nuclear fission should be used in breaking ground for a pioneer plant that will be run by nuclear fission.

TVA Gets the Facts

Dixon-Yates signing looms as AEC-TVA talks bring about accord

Signing of the controversial Dixon-Yates power contract appeared imminent last week as the Administration moved to clear the path to approval by the Joint Congressional Atomic Energy Committee.

These were recent developments:

- Newly appointed TVA Chairman, Brig Gen Herbert D. Vogel and the AEC announced a "meeting of the minds." Chairman Vogel visited AEC General Manager K. D. Nichols in Washington last week, just after taking office, and they jointly announced agreement on the major issues. "There are now only details to be worked out," Vogel said.
- Atomic Energy Commission supplied TVA with all details of the controversial power contract, and the staffs of the two agencies dug into final legal studies in preparation for joint negotiations of a follow-up agreement. This, on the face of it, satisfied demands of TVA's two Democratic holdover board members, Vice Chairman Harry Curtis and Raymond Paty, who had insisted on being supplied complete data on the deal before TVA would enter negotiations with AEC.

TVA's concurrence in the contract is essential, since the 600,000 kw to be supplied by the Dixon-Yates steam plant at West Memphis, Ark., would be fed into the TVA system. It would replace power TVA now supplies AEC's Paducah, Ky., atomic plant.

May Call Meeting . . . While the Joint Committee awaited further developments before rescheduling a public hearing on the contract, it was expected that Chairman Cole, co-author of the bill approving the Dixon-Yates contract, would call another meeting as soon as final agreement between AEC and TVA was in sight. The Joint Committee must waive a required waiting period if the contract is to be signed this year, and a public hearing on such an action is customary.

To push through Joint Committee approval quickly would be fairly easy for Cole, who wants the contract signed since it represents the kind of industry cooperation he favors. Cole has worked long and hard on the new atomic energy law recently signed by

the President, which stamps Congressional approval on Dixon-Yates. While he has announced his intention to give Democratic opponents their day in court on the contract, Cole will not permit a political grand-stand play to hold up the contract signing.

This week, the possibility of a public power bloc move to delay signing of the arrangement appeared more remote. The Administration's action in belatedly supplying TVA with full details on the contract dried some of the wash TVA had been publicly hanging out. It did not satisfy the vigorous demand of Democratic National Chairman Stephen A. Mitchell that the details of the contract be released to the public, but it did show the voters that the Administration would not try to pull a sneak play on TVA.

Sneak Hinted . . . The two senior TVA members had hinted in a recent letter to the Budget Bureau there was such a play in the works. The letter, written by then-acting chairman Curtis, and concurred in by Paty, said in part: "To illustrate our concern over the possibilities of productive negotiations, AEC and the Bureau of the Budget representatives have been pressing us to enter into negotiations immediately so that AEC can consummate its contract with Dixon-Yates. But AEC has made available to us no more than selected excerpts from the draft of agreement. They have informed us that in their opinion these are the only provisions which concern us. But you can understand that this is a conclusion which we would want to arrive at independently after a careful analysis of the whole instrument rather than to accept AEC's assurance that we have no need to see more than the excerpts which they have transmitted to us."

Curtis and Paty made it clear they did not intend to open AEC-TVA negotiations until full information had been supplied them.

Still Political Issue . . . It is still expected that the Democrats will campaign in November on Dixon-Yates. Whether the contract is signed by then, or still hanging fire, the public power bloc intends to point to the deal as one of the "giveaways" they attribute to the Republican-controlled 83rd Congress and the Eisenhower Administration. They will continue to call it a back-door attack on TVA, and hint at corruption on a high level of government.

Missouri Projects Get Funds

Reclamation Bureau can start construction on six Missouri River Basin units, and advance building of three other Far West projects with $7,120,000 made available by the Supplemental Appropriations Act signed last week by the President.

Missouri Basin work with the funds will supply 51,000 acres of land with a full irrigation supply, and supplement supplies to 4,600 acres. It will add 72,000 kw of hydro power to the Western Division.

The act also provides $400,000 for general investigations, and raises the limit for personal services by $3.5 million. It allows use of $250,000 of funds on hand for additional study of Garrison diversion unit in North Dakota and for the White River, and emergency rehabilitation of Willow Creek Dam in South Dakota. Reclamation can use a "reasonable amount" of fiscal 1955 funds for studies of the Missouri diversion unit.

In addition, the Yakima project, Kennewick Division, Wash., the Cachuma project, Calif., and the Gila project, Ariz., received allotments of $900,000, $520,000 and $900,000, respectively, for advancement of work.

New starts and amounts earmarked for them are:

Unit	Construction	Amount
Glendo, Wyo. (Specifications to be issued in September, contract in November)	Dam & power plant on N. Platte R.; power plant in Fremont Canyon; combined installed capacity, 72,000 kw.	$1,000,000
Hanover & Bluff, Wyo.	Irrigation works.....	450,000
Heart Butte, N. D.	Irrigation facilities .	300,000
Helena Valley, Mont.	Pumping plant; design and preconstruction work on tunnel, regulating dam and reservoir at Canyon Ferry..	250,000
Sargent, Neb.	Milburn diversion works and canal section	1,000,000
Bostwick, Neb.-Kan.	Additional canal work in Nebraska and initial construction of Lovewell Dam, Kan.	1,350,000
Transmission Division, Missouri Basin	Start construction of 115-kv line to Belden, Neb.	450,000

Cisler, Powell Win ASME Medals

Walker L. Cisler, president of Detroit Edison Co, and Edwin B. Powell, consulting engineer of Stone & Webster Engineering Corp, Boston, have been named recipients of ASME medals by American Society of Mechanical Engineers.

Cisler will receive the ASME George Westinghouse Gold Medal Award, which is presented for eminent achievement or distinguished service in the power field of mechanical engineering. Powell will get the ASME Medal, which is awarded for distinguished service in engineering and science. The awards will be conferred at the annual meeting of ASME in New York Nov. 29-Dec. 3.

LONG ISLAND LIGHTING linemen are shown repairing a 3,300 v line in North Bellmore, N. Y., which was struck by storm's winds

WIRES in front of the Engineers Club in Glenwood Landing, N. Y., were victims of Hurricane Carol's winds

POWER IS BEING RESTORED AFTER HURRICANE'S SPREE

Power service is gradually being restored in the New England and Middle Atlantic areas raked by Hurricane Carol when that "lady" went on its $500-million binge.

From New England, which was hit hardest by the hurricane's 100-mph winds, Boston Edison Co reported that service was restored by Sept. 7 to 97% of its 450,000 customers. About 150,000 had been without power.

Reports $2-Million Loss . . . New England Electric System reports that 712,000 of its 720,000 customers were getting service by the morning of Sept. 7. At the storm peak about 540,000 customers were without service. Estimated costs for repairs and lost revenues is about $2 million. Narragansett Electric Co, Providence, R. I., by Sept. 8 restored power to 98% of its 200,000 customers.

On the Massachusetts cape, Cape & Vineyard Electric Co had service back to 90% normal by Sept. 2.

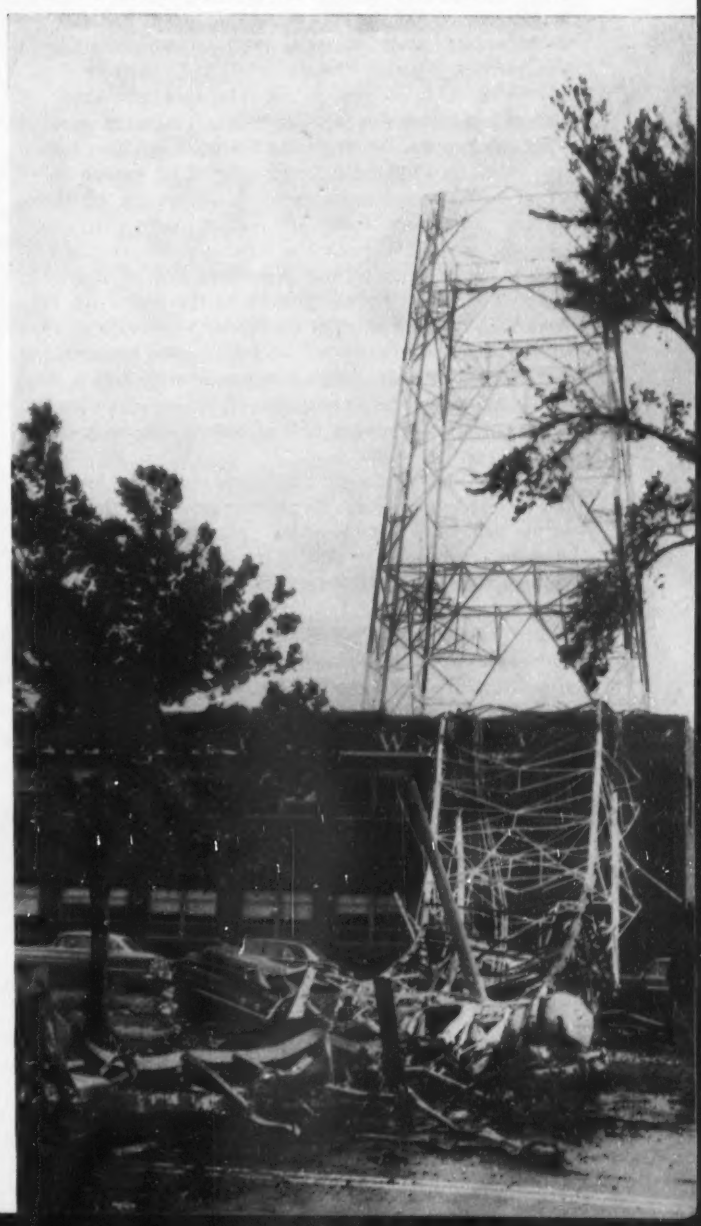
Public Service Co of New Hampshire, whose distribution lines were hard hit, expected to have all service, except the eastern area, back to normal Labor Day.

Central Maine Power Co was back to 85% normal Sept. 2 after 70% of its load was lost at the storm peak. Central Vermont Public Service Co had minor storm damage.

Connecticut Light & Power Co restored all service by Sept. 4. At height of the storm, about 100,000 of its 260,000 domestic customers were out of service. Connecticut Power Co, whose New London Division suffered the most damage, had power to 98,000 electric users restored Sept. 4. Hartford Electric Light Co by Sept. 4 had power to 30,000 stricken customers. It has 101,328 users.

New York . . . In the New York area, Long Island Lighting Co crews had the bulk of outages restored within 48 hours after the storm hit. About 275,000 of its customers were off the lines. Consolidated Edison Co of New York, Inc, had restored service by Sept. 2 to 105,000 customers hit.

STEEL TOWER of Station WBZTV, Boston, toppled over when Hurricane Carol hit New England. About 150 ft of 649-ft tower stands



IN THE INDUSTRY

In next week's issue (Sept. 20) Electrical World will present its annual forecast of the industry. The forecast will be optimistic because anyone studying the data available can make no other. One of the factors that will be reported on is the increase in generating capability. In 1955 Electrical World predicts that utilities will put 11 million kw on the line; in 1956, 8.8 million kw; and in 1957, 6.3 million kw. These totals for 1956 and 1957 are below current orders.

Order Lull Ends as Time Grows Short

Looking askance at these figures are the manufacturers of power equipment. To date they report that they do not have the orders which will make the equipment a reality instead of dreams on drawing boards. They feel that electric companies are delaying too long in placing their orders. Some told Electrical World that they were afraid that some utilities had been overestimating the capabilities of the manufacturers. Though it is rather easy to get a place on the manufacturers' schedules, it still takes about 30 months after a utility's board of directors has approved a generating unit to get it in operation. Boilers aren't quite as bad, but the manufacturers want 24 months, 12 to manufacture and 12 to erect.

Orders in a Bunch Are Nothing New . . . As an example of what can happen, Westinghouse Electric Corp goes back a few years. In 1949 the industry ordered 1.1 million kw of steam turbine generators and 1.7 million kw of hydro turbine generators from all manufacturers. In 1950 came the Korean War. Orders for that year soared to 13.2 million kw of steam turbine generators, slid off slightly to 1.6 million kw of hydro. Since then the orders for both have been tapering off. For the first seven months of 1954 orders placed were really off—1.3 million kw of steam and 300,000 kw of hydro. This is approximately only a third of the volume needed to keep manufacturing plants loaded. It also presages a sudden flow of orders with every utility wanting its order filled first.

In fact General Electric Co reports that since Aug. 1, it has received more orders for turbine generators than it did in the first seven months of the year. But again the time element is stressed. It usually takes about 20 months to manufacture a unit. Delivery and erection adds to the time.

Boiler Manufacturers Tell Same Story . . . The situation on orders for boilers is identical to that for turbine generators. Combustion Engineering, Inc, reports that orders have been low. But again the cyclic nature of equipment ordering is being felt. In recent weeks the company has had more active inquiries than at any time in the past two years. A scramble is expected before the end of the third quarter in line with recent experience with turbine-generator orders.

Babcock & Wilcox concurs on this report on the boiler market. Business is getting more active as the summer season is ending. But the company points out that there is little time left to place orders for equipment to go into operation in 1956.

There is at least one cheerful note in the equipment order picture. Manufacturers agreed that the power transformer situation is not alarming. It doesn't take so long to make one as it does to make a turbine generator or boiler, and a transformer can be installed in a very short time. But again manufacturers like to have orders as far in advance as possible. It makes for more orderly operation of their plants. And any manufacturer can do better work on a normal schedule than in a rush.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Automatic control assigned to an efficient generating unit may result in the unit operating at a point where boiler, feed pumps, coal pulverizers, FD and ID fans will not need to operate continuously at full load.

Cutting tools used on magnesium must be kept sharp to reduce friction heat and reduce explosive dust. Cuttings should be removed frequently and "no smoking" is imperative.

Floor space was 30% less and volume 40% less for the controlled circulation boiler at Chesterfield Station than for a natural circulation unit. Weight was 500 tons less.

Fisheye and cracking of welds has been traced to the action of hydrogen released from the moisture dissociated in the arc. Good to keep electrodes dry.

Turbogenerator at rated load takes 2 to 7 seconds to lose synchronism after losing its excitation. This is long enough for voltage regulators to effect big improvement in voltage.

Maximum solar radiation incident on the earth's surface is one-eighth kw per sq ft. In the latitude of New York it is about ¾ that much or 0.0968 per sq ft.

Tubes are the cause of most failures in power plant electronic control circuits—more when operated intermittently than when operated continuously.

Impedance of a cable carrying one-way fault current in an iron conduit is practically twice the basic impedance of a corresponding length of the conduit.

Intermodulation in either transmitters or receivers may cause interference when three or more mobile-radio channels are operating in the same general area.

Conduits and cables on bridges should preferably be installed on north or east side of the structure so that they will not be subjected to direct rays of the sun.

Tinning solder consisting of 77.18% tin, 20.47% zinc, and 2.25% lead has been used successfully for wiping joints of aluminum cable-sheath without flux.

Poles on the Bell System (18 million of them) would encircle the earth four times if laid end to end at the equator.

Plastic tubes might prove lighter to handle and equally as safe as wood rods for live-line tools.

New "Coastal Finish" touch-up

"sprays" away transformer nicks—scratches

Nicks or scratches that occur in handling transformers can be easily and quickly sprayed away when you use the handy new Westinghouse "Coastal Finish" Touch Up. No messy brushes—no awkward buckets. Just press the button!

As you know, exclusive Westinghouse transformer "Coastal Finish" is the best laboratory and field tested answer to rust and corrosion—under any weather or atmospheric conditions.

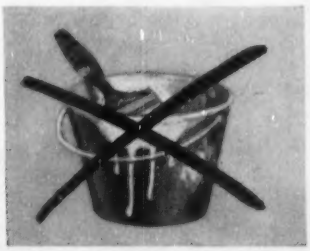
Now, the finish coat of the "Coastal Finish" system is available in handy 12-ounce pressurized cans for convenient application . . . anywhere. Full directions for use appear on the label.

For complete information on Westinghouse "Coastal Finish" Touch Up call your nearby Westinghouse representative. Or—if you prefer—write to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. You will get prompt attention.

J-70716

YOU CAN BE SURE...IF IT'S Westinghouse

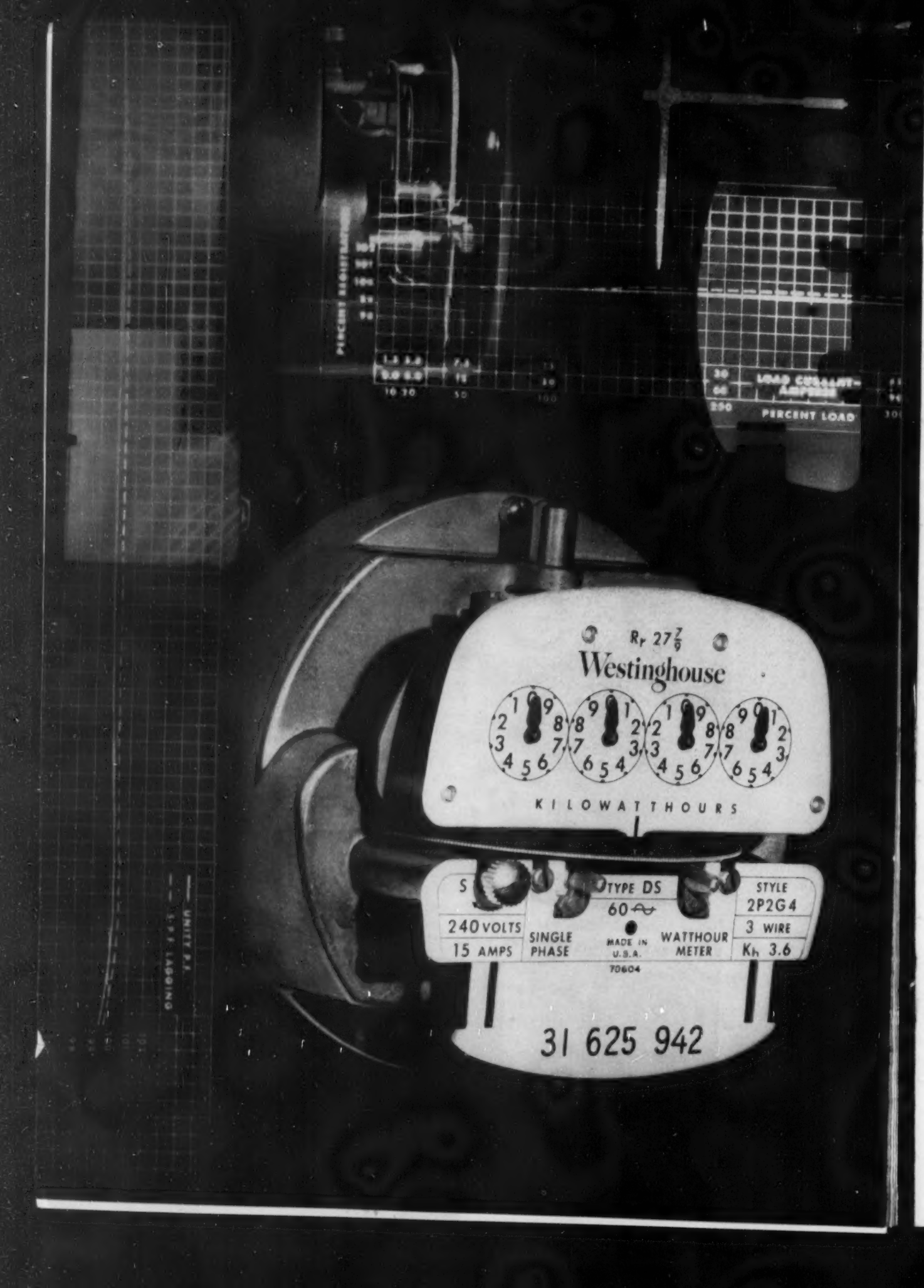
USE "COASTAL FINISH" TOUCH-UP



NO BRUSHES—NO BUCKETS

ON THE POLE

ON THE GROUND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PERCENT LOAD

Helping the industry meet its growing loads

New Lifetime Meter will handle all single-phase loads

Electric utilities are now faced with the necessity of replacing many old meter installations because they do not have the range and thermal capacity required for modern loads.

For the replacement of such meters and to provide for any single-phase metering requirements in the foreseeable future, Westinghouse has introduced the Lifetime Meter—a meter with a truly amazing range. It will measure accurately all loads from less than 0.1 ampere to 200 amperes.

Lifetime Meters are offered in two ratings—Type A (bottom-connected construction) and Type S (socket construction) to handle loads up to 100 amperes, and in the S-mounting to handle up to 200 amperes.

The American watthour meter industry has for many years produced a high-quality product from the standpoint of economy, accuracy and long life. Westinghouse has contributed much to this high state of development. Over 66 years* of experience in the design and manufacture of watthour meters have been incorporated by Westinghouse engineers into this new Lifetime Meter . . . and the extended development work required has paid off by making it a better product.

The final result is a more simplified and highly perfected meter—made possible by the most modern engineering and materials. So far advanced is the Lifetime Meter that it can be guaranteed for thirty years.

This guarantee emphasizes the validity of every claim made for this new meter . . . truly a Lifetime Meter. J-97184

*Shallenberger Meter—1888

YOU CAN BE SURE... IF IT'S

Westinghouse

Lightning surge protection

Here's how the problem of lightning surge damage has been handled in the Lifetime Meter. Both the current and the potential coils in the meter have a 10,000-volt insulation level. The socket-type meter has a De-ion® arrester gap located in the back of the base and arranged to discharge outside of the meter. In the bottom-connected (A-base) meter, a relief gap is provided between the series winding and the base. The gaps discharge at 4500 volts, well under the 10,000-volt insulation level of the coils, draining off surges safely.

Corrosion protection

The Lifetime Meter represents a sound approach to the truly corrosion-proof design, a vital factor in long life. The register gears and shafts have a gold finish. The socket-meter base is Moldarta*, a special, Westinghouse-developed plastic. The laminations in the electromagnet are Bonderized, the most effective finish yet found for locking out corrosion at this vital point.

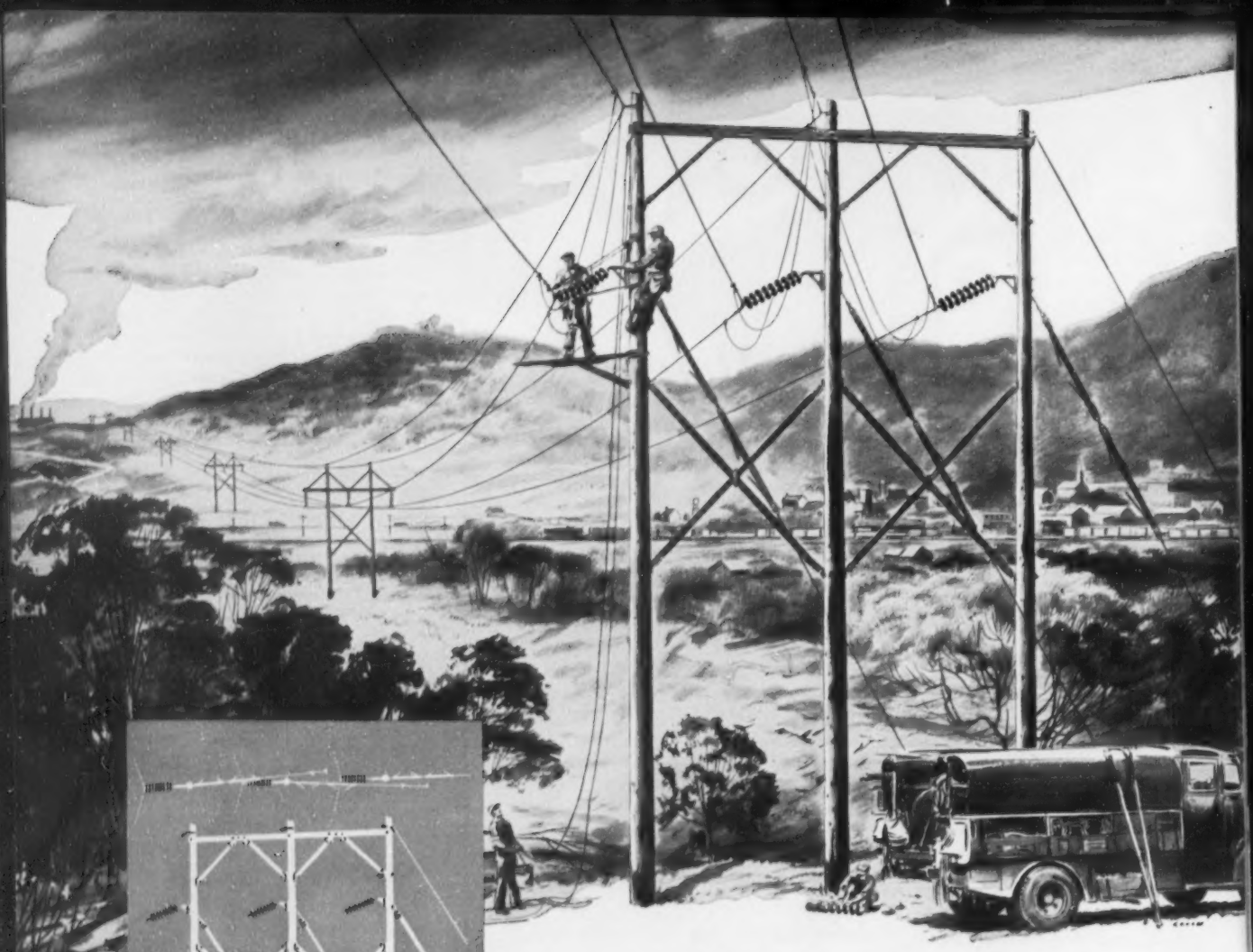
The cover rim and sealing ring are iridited aluminum. All materials and finishes are selected and co-ordinated to give maximum protection against corrosion.

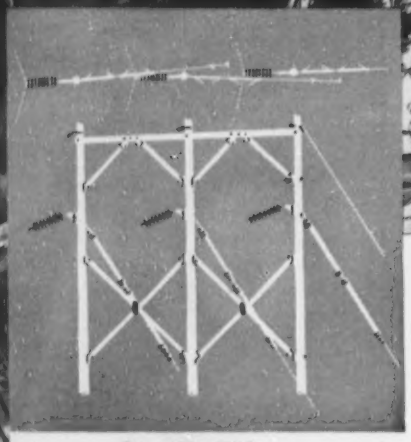
*T. M.

Stability

In order to provide long-life accuracy, a meter must have mechanical, electrical and magnetic stability. Here is how these qualities have been achieved in the Lifetime Meter. Every part of the meter is built and controlled within tolerances that eliminate the need for any adjustments in order to make parts fit. There is no chance of any variation to cause accuracy changes in service.

The Lifetime Meter features the ball and jewel bearing, pioneered by Westinghouse in 1902; the only time-proved lifetime bearing. Action is unimpaired, even under extreme overloads.





Type No. 708 —
Medium Angle Structure*

Quantity	Description
2	Crossarm
3	Stud bolt ⅞" w/2 washer nuts and locknuts
2	Filler block
6	Stud bolt ¾" w/2 washer nuts and locknuts
4	Knee brace
3	Swinging angle bracket 2/plate and bolts
7	Machine bolt ⅞" w/sq. nut and locknuts
4	Flat washer 4" sq. x ¼", 15/16" hole
2	Curved washer 4" sq. x ¼", 15/16" hole
2 sets	Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers
3	Pole band
3 pr.	Connecting link
1	Guy roller
1	Machine bolt ¾" x 2½"
6	Wood strain insulator
2	Suspension clamp for static wire
As req'd	Suspension insulators and fittings
As req'd	Guying material
3	Link

**This print was reproduced from the Graybar Bulletin GB-5076A on High Voltage Transmission Line Materials. This 88-page book covers, in condensed form, Graybar materials for line construction. Write us, if you do not already have your free copy.*

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Fire Shuts Plant

Transformer, generator bus damaged by blaze at Montana Power station

Fire of undetermined origin forced a shutdown on Aug. 30 of Montana Power Co's 35,000-kw Rainbow hydro plant near Great Falls, Mont. Destroyed or severely damaged by the fire that started at 12:27 a. m. was a 6.6/100-kv, 2,400-kva transformer and the 6.6-kv generator bus. The plant switchyard was not involved in the outage. Company engineers have reason to believe the transformer failure was the result of the fire, rather than the cause.

According to Ray Ball, acting chief engineer of Montana Power, "when the trouble occurred, apparently the first casualty was the dc control system in the plant. Loss of dc control immediately rendered all automatic protective equipment inoperative."

Three Explosions . . . Dix Shevalier, Great Falls division manager, reported that "when the transformer failed, a tremendous amount of power was fed into the generator bus. This caused three explosions that rocked the plant." Electric arcs damaged or destroyed a large part of the low-voltage bus and ignited inflammable material.

Numerous north-central Montana communities were without power for about an hour because of the fire. The Rainbow Dam plant serves as a switchyard for power from Ryan and Morony Dams. Power from these plants was unaffected by the blaze so no power failure was caused in Helena, Butte, Anaconda, and other cities supplied by Montana Power Co.

Other Plants Pick Up Load . . . Operators on duty at the plant, augmented by all employees at Rainbow camp and later aided by the Great Falls fire department, fought and put out the fire. Service was restored to affected communities by switching power from other system sources of generation.

R. A. Reid, Butte, superintendent of generation, said the temporary halt in power production at Rainbow Dam will be no problem. The plant was operating at considerably less than capacity, he said, and its production can be handled from Ryan, Morony, and Black Eagle plants of the company.

Ontario Station Gets Off to a Royal Start

Her Royal Highness the Duchess of Kent gave the official signal on Aug. 30 that placed in service three 100,000-hp generating units at Sir Adam Beck Station No. 2 near Niagara Falls, Ont. With the duchess is Robert H. Saunders, chairman of Hydro-Electric Commission of Ontario. When the duchess pressed the button that put the units on the line, lights on the ceremonial platform immediately flashed on, illuminating the name of the new plant and spelling out "More Power for a Greater Ontario" and "More Power for a Greater Canada." New hydro station's ultimate capacity will be 1,828,000 hp.

Power Is Election Issue in Idaho, Oregon Races

Public vs private power policy conflicts in the Northwest have been made formal campaign issues for the fall election races by the Democratic and Republican parties in Idaho and Oregon.

In Idaho, where Hells Canyon is a hot issue, former Sen Glen H. Taylor opposes Republican Sen Henry Dworshak. In Oregon, where key issue is Columbia basin hydroelectric development, Republican Sen Guy Cordon, proponent of Administration's partnership concept, is pitted against Democratic State Sen Richard L. Neuberger, backer of federal development.

Idaho Election Race . . . For the first time in Idaho's political history, both parties have adopted platform planks dealing with the question of development of Snake River along Idaho-Oregon border.

Democrats urged at a meeting in Idaho Falls Aug. 26 that the federal government construct a high, multiple-purpose dam at Hells Canyon.

At its Boise platform convention, the Republican party opposed federal construction of a high dam at site.

Senator Cordon launched his campaign on Aug. 28 in Ashland, Ore., at an irrigation district dedication in which he soft-pedaled partisanship. But he already had declared that in the campaign, "I'm going to talk about power and partnerships and I'm going to give the whole picture. . . ."

Interior Secretary Douglas McKay has been campaigning for Cordon. Sen Wayne L. Morse, an Independent, has spoken out for the Democratic slate and against the McKay-Cordon team and GOP power policies.

Walla Walla District, Corps of Engineers photo

McNARY DAM on the Columbia River is part of $286-million Army Engineers multi-purpose project. Powerhouse, shown in foreground, is on the south or Oregon shore of river

'ASSEMBLY LINE' METHODS SPUR McNARY DAM POWER

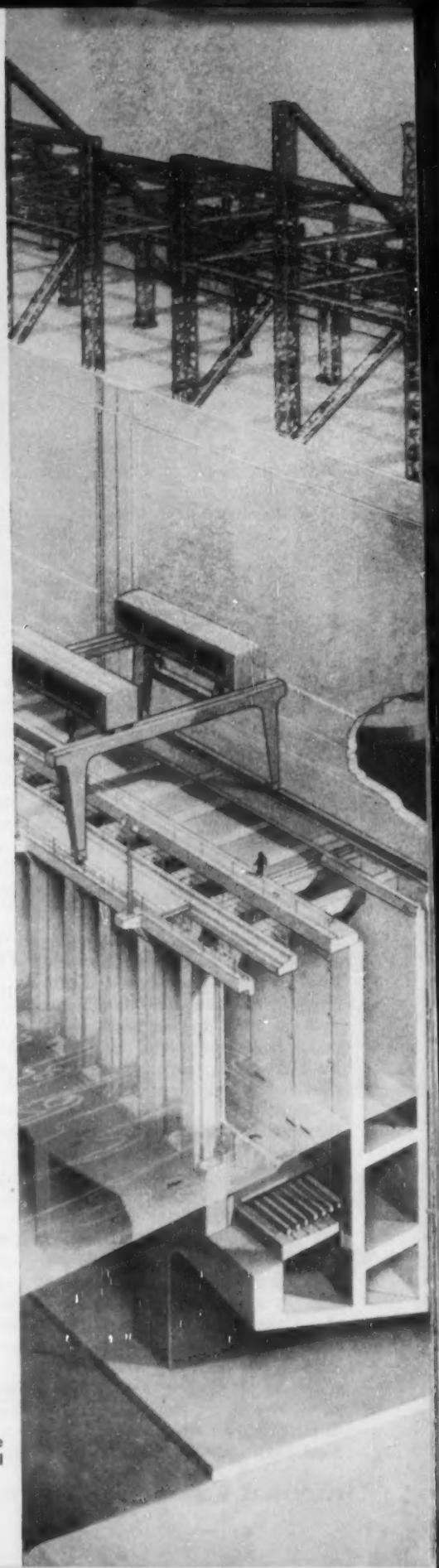
Six of the projected 14 hydroelectric units at McNary Dam on the Columbia River are expected to be producing power for the Pacific Northwest before Christmas 1954. This Christmas gift of two more generators to the Oregon-Washington region, according to Col. F. S. Tandy, former district engineer of the Walla Walla District, is being made possible because the U. S. Army Corps of Engineers has introduced "assembly line" procedures for installing hydroelectric units. These may go on the line even in November. President Eisenhower will dedicate the dam on Sept. 23.

When McNary Generators 5 and 6 go on the line, 140,000 kw rated capacity will be added to the Northwest power grid for meeting the area's critical winter needs. They will boost to more than 420,000 kw the total power output of the project. Until Army engineers streamlined installation procedures, however, their "unit-every-90-day" schedule lagged as much as 16 months.

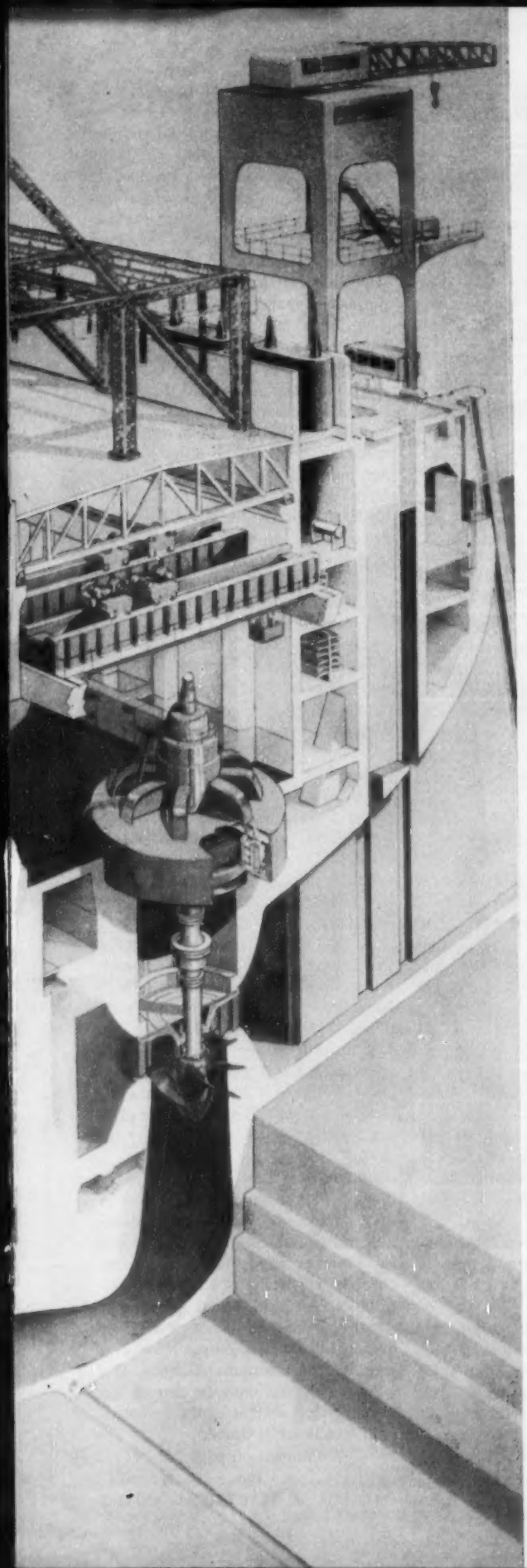
McNary began feeding power into the Bonneville Power Administration's transmission lines on Nov. 6, 1953, a full 30 days ahead of schedule. The first of its 70,000-kw generators to go into operation was the largest of its type ever built, and it was expected then that the plant's full rated capacity of 980,000 kw would be attained late in 1956.

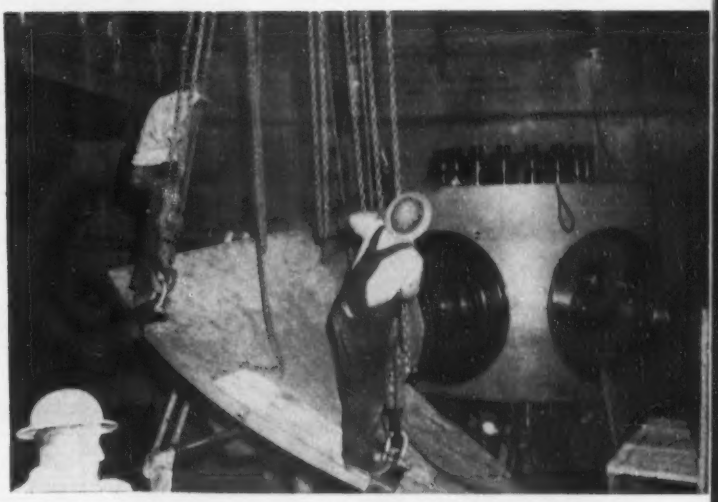
Delays . . . This schedule began to slip as the Korean War, the priorities and allocations system of the Defense Production Act of 1950, a 63-day steel strike, and a strike at the turbine manufacturer's plant delayed deliveries.

These cumulative delays prompted Army engineers to devise speed-up procedures. They sought a program coordinating the functions of various contractors and reducing the time for shipping turbine and generator parts and other heavy materials.

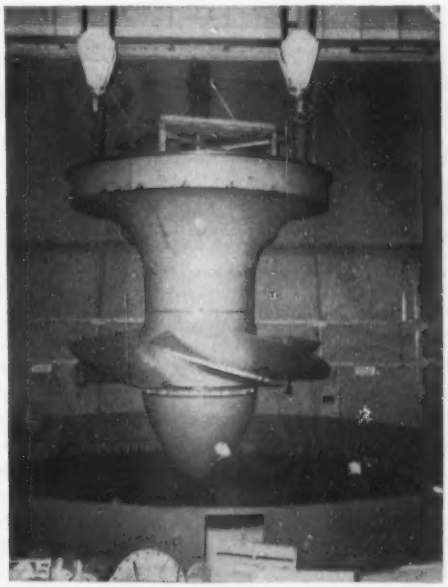


CROSS-SECTION by the artist depicts the installations inside and above the McNary Dam powerhouse, together with equipment being placed at each level

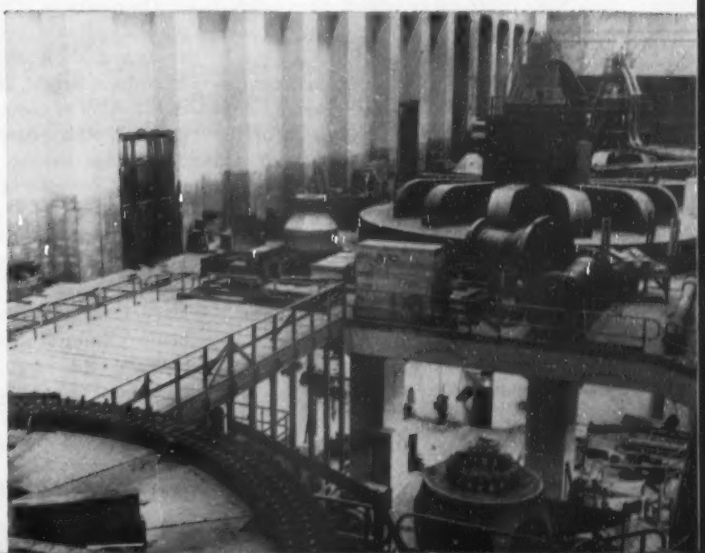


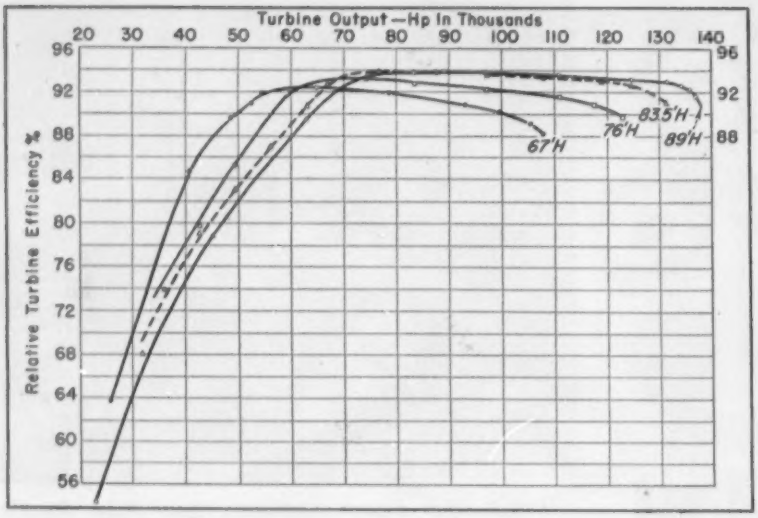


TURBINE BLADE is shown as it was being inserted in hub after the rocker linkage had already been hoisted from position in the jig below



TURBINE RUNNER and inner head cover (above) are lowered into position through generator stator. Generator rotor (below) has been assembled on machine floor, and the turbine runner may be seen on floor below





FIELD TEST PERFORMANCE data were obtained by index method at various tailwater conditions. Output of about 138,000 hp at 89-ft head is largest developed by adjustable-blade turbine

Because of the great amount of conduit traversing construction joints to reach controls and auxiliary equipment, the even floor units were poured in advance of the odd units. To save time, a method was devised for pouring floor slabs progressively.

Time Gained . . . The streamlined procedures had their effect. In mid-June Generator 4 went on the line for commercial power generation only 15 days behind schedule. Army engineers now look forward to Generator 5 going into operation on time and Generator 6 moving ahead of schedule. Units 7 to 12, inclusive, all American manufactured equipment, are expected now to be completed ahead of schedule to an increasing extent, amounting probably to two or three months. The installation dates of the two English manufactured generators, Nos. 13 and 14, cannot be predicted at this time.

McNary Project . . . McNary navigation lock and dam, designed and constructed under the supervision of the Walla Walla District Office of the U. S. Army Corps of Engineers, is a $286,000,000 multiple-purpose project with power generating equipment. It constitutes another unit of the Corps of Engineers' plan for comprehensive development of the Columbia River and its tributaries.

Situated 292 miles upstream from the mouth of the Columbia River and 3 miles east of Umatilla, Ore., the project includes a dam, power plant, navigation lock and appurtenant facilities for navigation and power development. Ample fish passage facilities along both shores of the river are part of the project, and the creation of a 64-mile-long pool behind the dam not only improves navigation upstream but provides recreational potentialities, wild-life sanctuaries, and river harbors and dock sites.

McNary Dam was started in October 1947 with the building of a huge horseshoe-shaped cofferdam jutting out from the Washington shore. The spillway dam, between the navigation lock on the north end and the powerhouse on the south, consists of 22 bays, each 50 by 53 ft, constructed at a cost of $31,120,000. The spillways are complete except for some final work on the hydraulic mechanism of the gates.

The spillway dam is 1,310 ft long with a spillway crest elevation of 291 ft and a deck elevation of 361 ft. Maximum height, foundation to deck, is 158 ft. The construction is concrete gravity with concrete apron and baffles for stilling basin. Maximum spillway capacity at normal pool is 1,480,000 cfs increasing to 2,200,000 cfs at maximum pool.

Turbines . . . The generators at McNary Dam are driven by adjustable-blade Smith-Kaplan propeller-type turbines, the most powerful now in operation. Each turbine is rated at 111,300 hp for a normal speed of 85.7 rpm and under an effective head of 80 ft. Effective head varies between 65 and 92 ft, and the turbines are guaranteed to develop 93,000 hp at the minimum effective head of 65 ft. At 80 ft and above, these turbines can develop more power than the output capability of the generators. They can maintain high efficiency over a wide range of load and provide high output under reduced head conditions. Thus they can derive more power from the average stream, where wide variations of flow and head occur.

To meet the accelerated installation schedule, S. Morgan Smith Co., the turbine manufacturer, redesigned the special machine which bores the runner hub for the runner blade trunnions and equipped it to turn the blade trunnions themselves. The redesigned tool not only speeds up the work but makes machine work more accurate in line boring and turning, thus reducing hand fitting of the blades and assembly time for the complete runner.

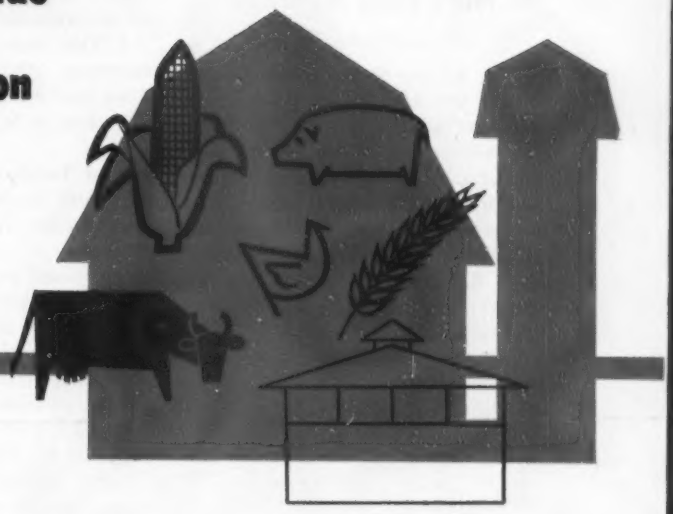
Reduction of "Bull" Work . . . Many new ideas have been developed to reduce "bull" work and use all available equipment to its best advantage. For instance, on the Kaplan runner assembly a small "A" frame mounted on rollers and provided with a small electric hoist is used exclusively to subassemble the blade rocker arm and its linkages. Use of this equipment releases the main crane and eliminates back-breaking manhandling.

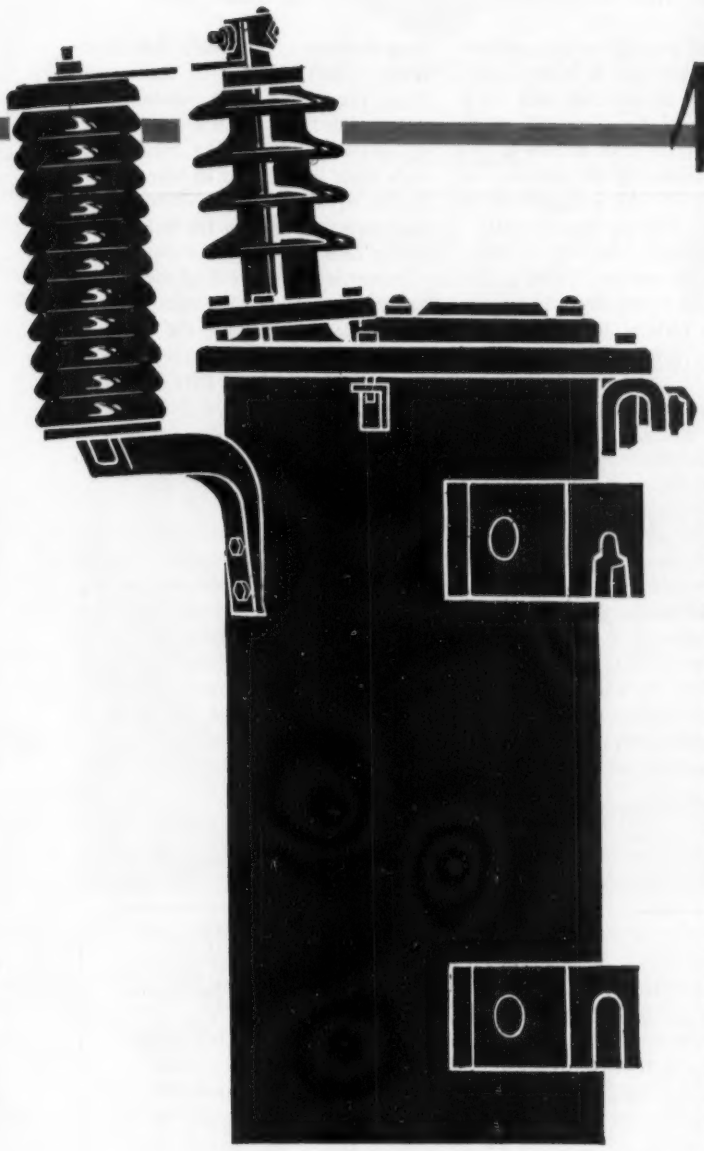
A cable can be attached through a small hole in the hub above each rocker. This permits each assembly to be raised into position for inserting the blade in the hub and rocker arm in a single operation. These holes are later plugged with a pipe plug. Tapped holes in the hub also permit the attachment of pulleys on angles for placing the lock ring.

Tests in the Field . . . The index method of testing turbines is used in the field because physical and hydraulic conditions make it practically and economically impossible to determine absolute efficiency of the prototype turbines. An index test is a means of determining the efficiency of the unit over its full range of output relative to an estimated maximum efficiency. The relative efficiency may be that of the turbine alone or that of the complete unit, whichever is desired.

(Continued on page 20)

Kuhlman Rural Transformers provide efficient, low-cost rural distribution





Made in Standard and CSP models, Kuhlman Rural Distribution Transformers are specifically engineered to give efficient, economical performance and maximum continuity of service for rural systems. These units incorporate the Bent Iron Core, a development of Kuhlman engineers that has never been equaled in the transformer industry. Made of cold rolled oriented silicon steel, the Kuhlman Bent Iron Core permits the flux path to follow the grain of the steel, insuring low loss, low exciting current and substantial weight savings. Exciting current is further reduced by the lapped joint construction of the core. Insulation of Kuhlman Rural Distribution Transformers in windings, leads, terminal boards and bushings is coordinated with the basic impulse level. Wide oil ducts allow ample oil circulation through the windings, insuring substantially uniform coil temperature and increasing short time overload capacity. Strong, sturdy construction, Corprene sealing gaskets and three coats of baked-on enamel finish protect Kuhlman Rural Distribution Transformers in severe weather, insuring utmost operating efficiency with minimum attention. The built-in features of Kuhlman CSP Transformers give protection against interruption of service due to lightning and overloads.

Utility engineers can get complete information about Kuhlman Rural Distribution Transformers by writing today for Bulletin CS-401. Kuhlman also manufactures Power, Dry Type, Subway, Saf-T-Kuhl, CSP and Series Street Lighting Transformers to the same high standards. We will be glad to send you our bulletins on these units also.

143-T

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • Southern Division, CRYSTAL SPRINGS, MISSISSIPPI

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SIXTY YEARS OF PROGRESS IN THE ELECTRICAL INDUSTRY

McNary Dam Advances

(*Continued from page* 18)

The relative discharge of the turbine is indicated by the difference in pressure between any two points of the turbine itself, or of its entrance passages, one at high pressure and low velocity and the other at lower pressure and higher velocity. The method is based on the Venturi Principle and $Q = K \sqrt{h_1 - h_2}$, where Q is the quantity of water in cfs, h_1 and h_2 are pressures at the two points of measurement in feet of water, and K is a coefficient determined by calculations as follows:

1. A curve is plotted of $\frac{hp}{\sqrt{h_1 - h_2}}$ against hp, and the hp selected at which $\frac{\% \text{ hp}}{\sqrt{h_1 - h_2}}$ (i.e., efficiency) is a maximum.

2. Maximum efficiency of the prototype turbine is calculated on the basis of model tests by means of the Moody Formula.

3. On the basis of 1 and 2 above, the Q is calculated as follows:

$$Q_{cfs} = \frac{hp \times 8.81}{H \times \text{efficiency}}$$

4. Knowing the value of $\sqrt{h_1 - h_2}$ for the hp obtained at this calculated value of Q, the value of K can be obtained, thus:

$$K = \frac{Q}{\sqrt{h_1 - h_2}}$$

5. The value of Q can be then obtained at all other test points, relative to this calculated Q value at maximum efficiency by multiplying each $\sqrt{h_1 - h_2}$ value by K. Corresponding relative efficiency values can also be determined for each test point.

Maximum Efficiency . . . The maximum calculated efficiency of the turbine in this case is 93.8%, this value being the model efficiency corrected to prototype conditions by the Moody Formula.

Points of note regarding these turbines are:

1. Maximum output of 138,000 hp at 89-ft gross head is by far the largest ever developed by a propeller type machine.

2. Power in excess of guarantees at the high heads comes about because of the requirements at 65-ft head, this being the determining factor affecting the selection of runner diameter.

3. Performance of the prototype in respect to cavitation checks with the model cavitation tests.

4. The blade-gate relationship for maximum efficiency as determined from model tests was found by the index tests to be correct.

Size of Turbines . . . Some idea of the size of the McNary Dam turbines is obtainable from the following dimensions:

Inlet water passage to each turbine is approximately 86 ft high on the reservoir face of the dam and 74 ft wide near the turbine stay ring. Rate of discharge from each turbine is 14,000 cfs. Diameter of the turbine runner is 23 ft 4 in. with an approximate weight of 423,000 lb without shaft.

Each turbine's rotating element weighs approximately 740,000 lb. The maximum hydraulic thrust developed by the turbine at normal speed and head is 1,950,000 lb.

Generators . . . General Electric Co is building the 12 American-manufactured generators. Each generator is rated at 73,683 kva at 95% pf and 13,800 v with a temperature rise not exceeding 60 C. The 32% guaranteed transient reactance required by the Corps of Engineers makes these generators equivalent in size to many 90,000-kva machines. With a net weight of 2,400,000 lb per unit, these generators are believed to be the heaviest hydro-generators ever built.

The mechanical arrangement of the generators includes two guide bearings and a thrust bearing located above the rotor. The thrust bearing is designed to carry over 4,000,000 lb.

In accordance with the expedited program, GE's crewmen are assembling generator stators in place while the hydraulic crew is working in the pit below. Clearances permit the unusual practice of lowering the runner through the completed stator.

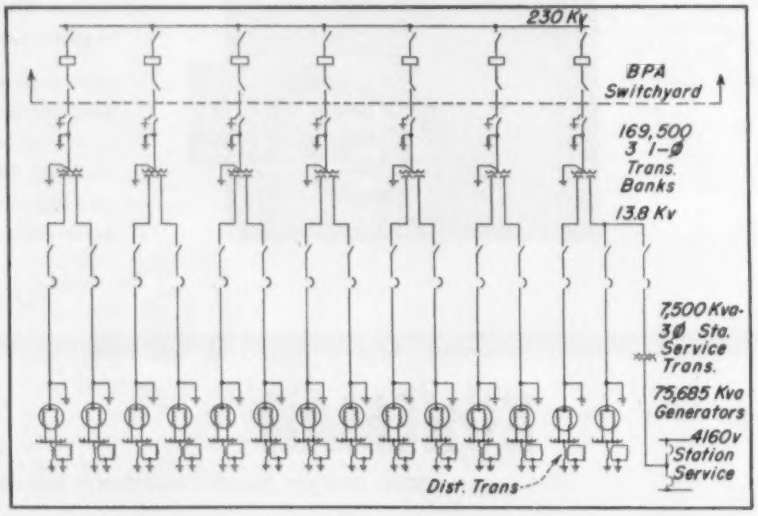
Transformers . . . McNary Dam transformers are in banks of three each. They are single-phase, oil-insulated, water-cooled units with a rated capacity of 50,000 kva. The capacity of each bank is sufficient to take the full output of a pair of generator units. The transformers are located on the intake deck of the powerhouse.

Power is brought out of the powerhouse by means of high-voltage cables in a cable tunnel under the tail race. This arrangement eliminates the usual maze of steel pull-off structures seen on top of hydroelectric powerhouses and is more economical because of the relatively great distance from the powerhouse to the Oregon shore.

Powerhouse . . . The powerhouse section of the dam has an overall length of 1,423 ft; an overall width of 241 ft; and a max. height from draft tube foundation to intake deck of 170 ft.

In addition to the provisions for 14 units in the powerhouse, the south embankment has been so designed that six additional units may be added to the south end whenever needed.

ONE-LINE WIRING DIAGRAM of McNary Dam powerhouse shows machines grouped in pairs on three-winding transformers. Connection between pairs is 230-kv bus in BPA switchyard



it's time for a new meter...

when Mrs. Steele gets her all electric kitchen

When Mrs. Steele is busy in her all-electric kitchen, she uses many convenience outlet appliances at the same time. This often proves to be too much for a meter *not built* to measure modern loads.

The new Sangamo J2 Meter is designed to measure not only today's loads but the loads of the future because it has plenty of reserve capacity . . . straight-line accuracy up to 100 amperes.

Corrosion-resistant materials and finishes, an oilless, maintenance-free bearing system and low disk speed all add up to extra long life.

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UP TO 100 AMPERES

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JM54-9

Counter-Shock Resuscitation Studied

Dr. W. B. KOUWENHOVEN, Dean of School of Engineering,
The Johns Hopkins University, Baltimore, Md.

Several years of research on the effect of electric shock on the human body have led to the conclusion that heart action may be restored by the use of a counter shock of proper characteristics. Voltage, current and duration must be carefully controlled, and so far the method has only been used successfully by a few highly trained men. Studies are continuing on the possibility of extending the method to practical application in the field.

Experiments have produced other information which may prove valuable. Skin resistances vary widely over the body. Knowledge of these skin resistance patterns may help in guarding against shock. There is also a possibility that studies of the skin resistance pattern may help the medical profession in diagnoses.

Actions of the human body are accompanied by electric impulse. When an individual makes contact with an external electric circuit the current that flows through the body will produce an effect which will depend upon the points where it enters and leaves the body and on the circuit parameters.

Epidermis Has High Resistance

Electric current enters and leaves the body at the points where the external circuit makes contact with the skin. Fortunately, our skin offers a high resistance to the current and is man's best protection against electric shock. Tissues and fluids of the body, with the exception of fat and bone, offer a practically uniform low resistance path, so that once inside the body the current spreads out in a more or less fusi-form shaped pattern.

Most of the resistance of the skin is in its outer layer, or epidermis. The epidermis contains no nerve endings or blood capillaries, and is a poor conductor. The inner layer, or derma, containing nerve endings and capillaries, is a good conductor.

The importance of the epidermis in limiting current is illustrated by the following experiment. Place two electrodes about the diameter of a lead pencil on the backs of the hands and measure the resistance of the circuit through the body between the electrodes. It will be of the order of 2-million ohms. Now stick the point of a needle through one electrode so that it just pierces the epidermis. The resistance will fall to roughly half its initial value. Now stick a needle through the epidermis under the other electrode and the resistance will fall to a few hundred ohms.

Resistance of skin on different parts of the body varies widely. Its lowest values are found on the face, the palms of the hands, the soles of the feet, the arm pits, the groin and certain other areas. Change in skin resistance, as one passes from a low to a high resistance area, is quite abrupt.

Skin resistance varies inversely as the area of the contact. The temperature coefficient of skin is negative and its resistance falls as its temperature increases.

Resistance of the epidermis depends also to some extent upon the voltage of the circuit. For example, the hand to hand resistance of a body, with 50 v a-c applied, was 10,000 ohms; with 500 v 1,200 ohms; and with 1,000 v 1,100 ohms.

Cuts and bruises, by penetrating the epidermis, reduce the protection the skin provides against electric shock. In a study of electrical resistance of the palms and fingers of the hand, one woman was tested on three occasions about a month apart. The resistance found by the first two tests gave a good check, but on the third test the fingers of her left hand showed a lowered value. After a repeat test failed to change the low value, she reported that she had spent the evening before in sewing a dress. Puncturing the skin with the needle apparently lowered resistance.

When thoroughly wet the resistance of the skin may drop to 1/100 of its dry value. This means contact with an electric circuit must be avoided in the bath room, and in other damp places. Dampness accounts for the increase in summer electric shock accidents among utility linemen.

Current Values Recognized

Electric current that flows through the body upon accidental contact with a circuit is determined by the voltage divided by the resistance. Unfortunately, this relationship is usually of little help because, even if the external circuit resistance is known, the resistance offered by the body is difficult, if not impossible to evaluate. The current that passes through the body may in some instances be approximated from the resulting injury and factors learned in the laboratory.

In electric shock the current flowing through a given pathway in the body, for a given time, determines the injury. The current values recognized and fairly well known are perception current, contraction current, "let go" current, freezing currents, fibrillating current, and blocking current that paralyzes respiration without affecting the heart.

A 1 ma 60 cps a-c produces a tingling or prickling sensation. The body's frequency response is practically constant from 20 to 300 cps. A direct current of 2.5 ma produces the same sensation as 1 ma of alternating current. Naturally some individuals are more sensitive.

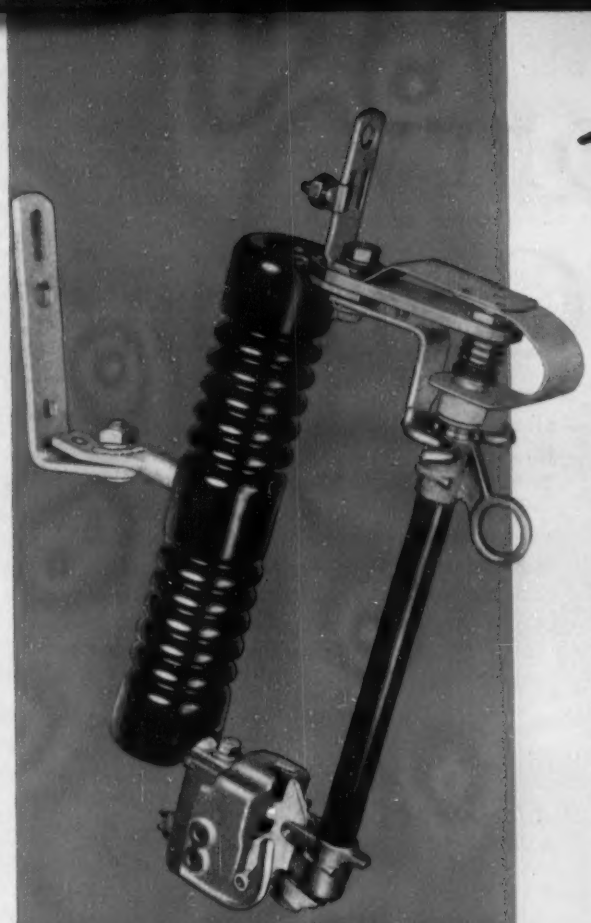
Contraction Causes Accidents

When a person receives an unexpected electric shock, even a slight one, his immediate reaction is to jerk away from the circuit. The passage of a current through the body causes an involuntary muscular contraction. Four or 5 ma gives a person a marked contraction and a sharp sensation. Although currents of this magnitude are not harmful in themselves, they sometimes result in serious accidents, such as the upsetting of an electric percolator or causing a workman to loosen his hold on a ladder or pole.

Small shocks may end in fatality. A university student checking a low-voltage circuit on the back of a control panel, received a weak shock. His involuntary reaction brought his shoulder into contact with a high-voltage bus, and he was killed.

It is therefore important that portable electric devices

(*Continued on page* 27)



New Easy Way to select cutouts

S&C's new XS Cutout carries short circuit interrupting ratings on a symmetrical basis, greatly simplifying calculations needed for cutout application. Predicated on known circuit characteristics, the symmetrical ratings match performance requirements at protection points.

Type XS Cutouts interrupt 4000 amp symmetrical (7.5 kv) and 3300 amp symmetrical (15 kv) at (1) sectionalizing points on distribution feeders, (2) distribution transformers, and (3) pole top capacitor banks . . . where the X/R ratio to the point of the fault is 4 or less. Cutout selection thus becomes direct and positive . . . conversion of fault currents from known symmetrical value to elaborately calculated asymmetrical values is no longer required.

Note that these ratings, which equal heavy-duty cutout performance, come at standard-duty cutout cost. It will pay you to obtain complete information on the Type XS Cutout contained in S&C's new Catalog Section 511.

Amperes, RMS		
Cutout Voltage Rating Kv	Asymmetrical Latest NEMA Std.	Symmetrical Alternate Suggested Std.
7.5	5000	4000
15	4000	3300

NEW SYMMETRICAL RATINGS SAVE TEDIOUS CALCULATIONS

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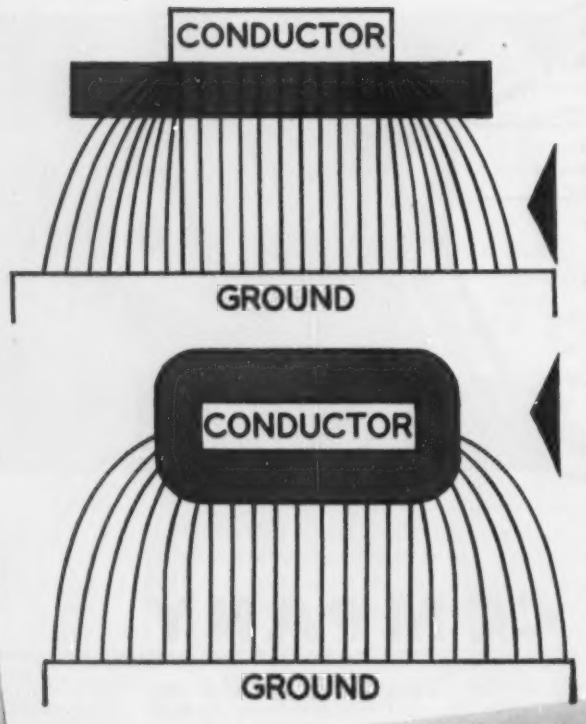
Why Worry About Corona?

Corona can be eliminated: Tests of many different designs and insulations over long periods under extreme voltage conditions prove it. Lessons learned from these tests have been applied at the thousands of points in a transformer where corona may develop. This is the first step in elimination of this damaging phenomenon. Proper dimensions, modifications in shapes, and careful application of latest insulation techniques are needed.

Allis-Chalmers applies these principles to all its power transformers. As a result, from the design standpoint, they merit the reassuring designation "corona-free."

But Allis-Chalmers does not stop with design. In addition, each transformer is thoroughly tested before shipment to provide a final check. When you buy an Allis-Chalmers power transformer you get a transformer that stays young because there is no corona that can cause damage.

How Corona Cuts Transformer Life



Corona is the cause of unexpected failure. It is a condition created by slight weaknesses in insulation or design. Its effects are cumulative. Although at the beginning corona is hard to detect, eventually it will develop into arcing and failure.

Using a simple dielectric structure, the diagrams show how corona develops and how it can be eliminated. Flux lines in the upper diagram illustrate how concentration at sharp corners of a conductor tend to cause very high stress at these points. If the stress is high enough, corona can develop and grow to the point where flashover must occur.

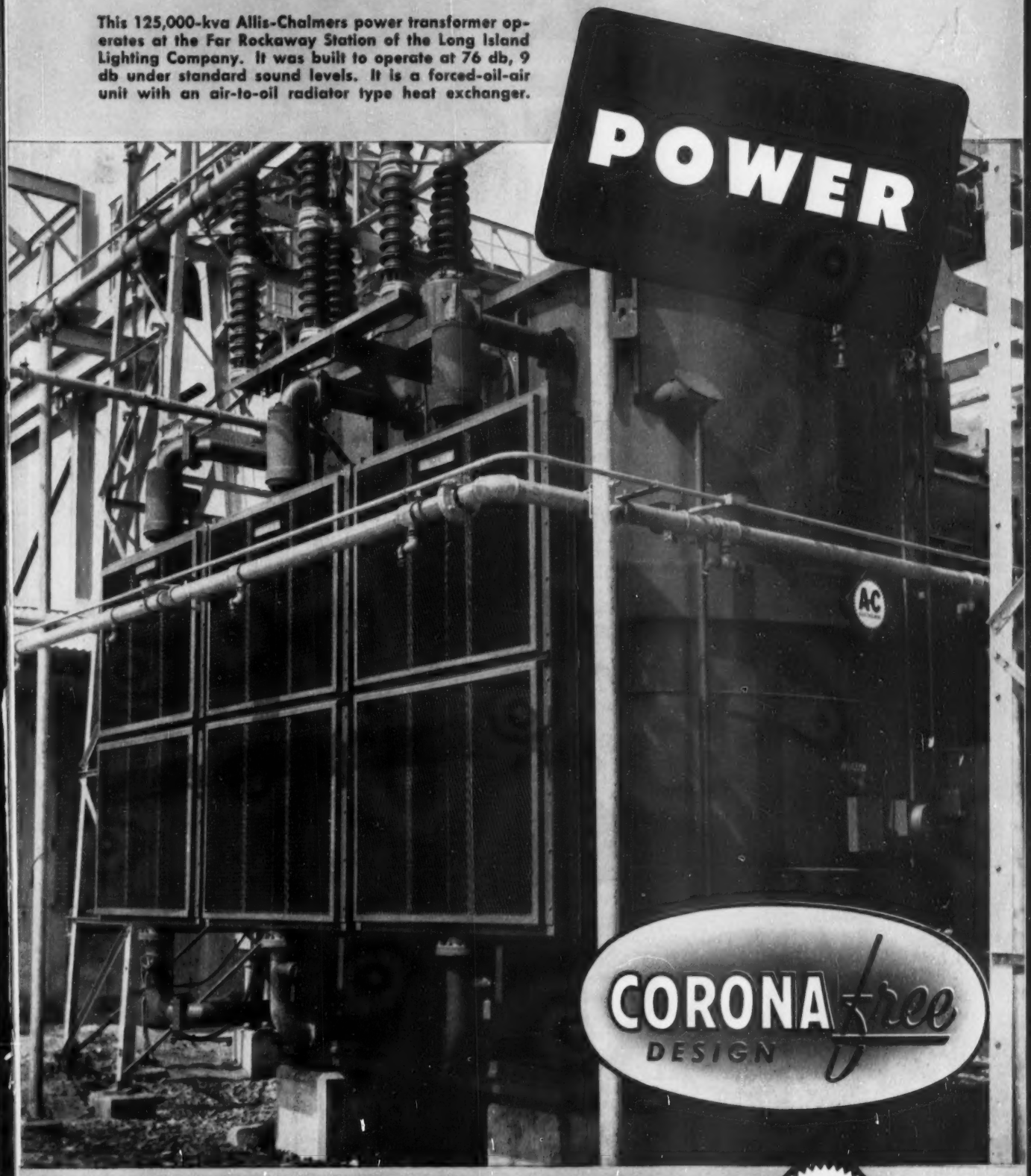
The lower diagram shows how to eliminate corona. Use of proper dimensions, correct insulation thicknesses, and modified shapes permits development of a structure in which corona cannot develop even under breakdown voltages.

Each of the thousands of points in a transformer where corona may occur is designed and tested to eliminate this possibility. Thus, Allis-Chalmers transformers earn their designation, "Corona-Free."

A-4438

ALLIS-

This 125,000-kva Allis-Chalmers power transformer operates at the Far Rockaway Station of the Long Island Lighting Company. It was built to operate at 76 db, 9 db under standard sound levels. It is a forced-oil-air unit with an air-to-oil radiator type heat exchanger.



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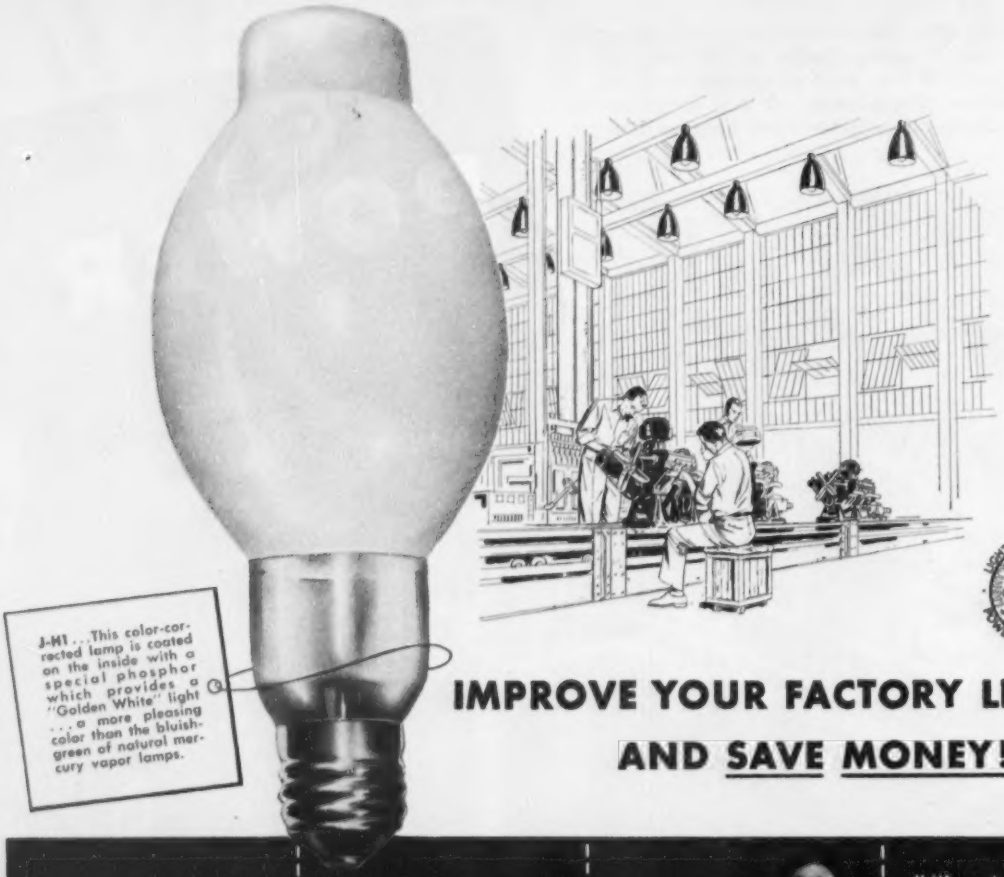
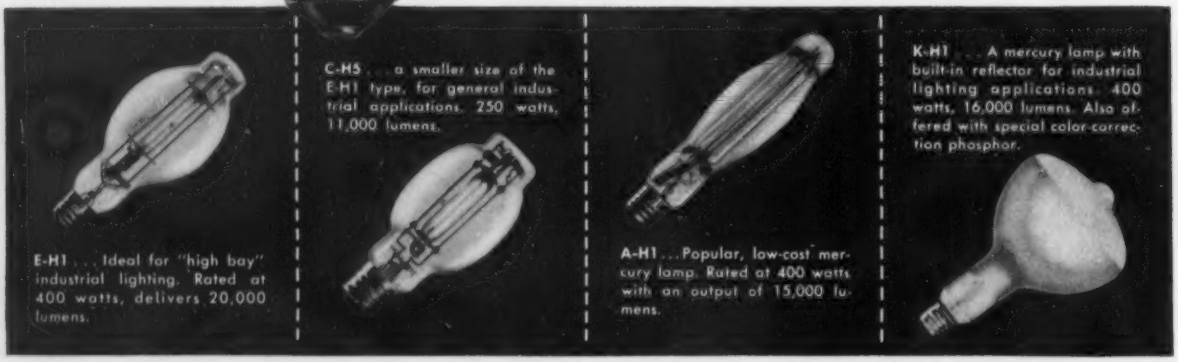


J-H1 . . . This color-corrected lamp is coated on the inside with a special phosphor which provides a "Golden White" light . . . a more pleasing color than the bluish-green of natural mercury vapor lamps.

LIGHT FOR FREEDOM · POWER FOR PROGRESS

IMPROVE YOUR FACTORY LIGHTING AND SAVE MONEY!



E-H1 . . . Ideal for "high bay" industrial lighting. Rated at 400 watts, delivers 20,000 lumens.

C-H5 . . . a smaller size of the E-H1 type, for general industrial applications. 250 watts, 11,000 lumens.

A-H1 . . . Popular, low-cost mercury lamp. Rated at 400 watts with an output of 15,000 lumens.

K-H1 . . . A mercury lamp with built-in reflector for industrial lighting applications. 400 watts, 16,000 lumens. Also offered with special color-correction phosphor.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

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These lamps give twice the light output for the same amount of wattage. And, they provide several times the life of incandescent lamps. As a result, Sylvania Mercury Vapor Lamps help to lower maintenance costs, improve seeing conditions . . . and speed production, too.

A Complete Line

Sylvania Mercury Vapor Lamps are available in types and sizes for every industrial requirement. Of special interest are the improved color-corrected lamps with the "Golden White" light. New illustrated folder gives complete information. Write to Dept. 4L-2823, Sylvania, for your copy today!

Counter Shock Studied

(*Continued from page* 22)

such as extension cords, tools and domestic appliances generally, be constructed with good insulation. Portable electric tools should be regularly checked and maintained in first-class condition.

The muscular contraction caused by an electric shock may freeze an individual to the circuit or it may throw him clear. It has also been known to break bones.

When the points where a person makes contact are very close together, no muscular contraction results even for currents of considerable magnitude. In an early attempt to drive the heart electrically, the electrodes were spaced about 0.03 in. apart. The electrical stimulus applied to these produced no reaction whatsoever. It was found necessary to space the electrodes about 0.1 in. apart before the heart responded to the stimulus. Experiments on the palm of the hand with contacts separated ⅛ in. produced not the slightest contraction with currents of 10 to 20 ma.

"Let Go" Current Determined

The "let go" current is that current value which an individual can voluntarily release without injury. Using a current path either from hand to hand or hand to feet, Professor Dalziel determined the "let go" current for men to be 9 ma and for women 6 ma. He found that 99.5% of the persons tested could release on their own volition their hold on the circuit at these current values.

Freezing current is greater than let go current. It contracts the muscles of the hand grasping the circuit to such a degree that the victim can't let go. Another person must promptly release him, and his skin will be blistered, and its protection lost.

A student, having washed his car, decided to use a portable electric drill with a polishing wheel to Simonize it. When he pressed the switch he received a shock and was frozen to the drill. His wife saw the contortions of his face and had the presence of mind to pull the plug. She saved his life, since a current that will freeze a person to the circuit is both extremely painful and dangerous.

Shock Causes Fibrillation

Normal operation of the human heart is accompanied by small dc potentials of a few mv. Therefore, it is not surprising that a current from an external source disturbs the heart. An alternating current of about 10 ma destroys the heart's rhythm and throws the ventricles into what is known as fibrillation.

Under these conditions blood circulation ceases. A current of 1 or more amp, however, will contract the heart and hold it contracted as long as the current is flowing. When the circuit is broken, the heart usually resumes normal beating, when duration of contact has not been too long.

The human heart beats about 75 times per min. In each heart cycle there are periods, for example, immediately following the contraction of the ventricles, when that organ is extremely sensitive to electric shocks of short duration. A small shock, lasting 1 milli-sec, may result in fibrillation if it occurs in the sensitive phase of the heart cycle.

In industrial accidents the most common path of an electric current is through the body from hand to feet. Under these conditions about 10% of the current flows through the heart. Minimum fibrillating current is thus 0.1 amp. Its maximum value is unknown, but it is considerably greater.

Fibrillating currents as a rule do not paralyze the respiration. The victim, with a fibrillating heart often gasps for air in a vain attempt to supply oxygen to his brain. Death ensues in a few minutes.

Blocking Current Affects Lungs

A blocking current is one that paralyzes respiration. Signals from the fourth ventricle in the brain go to the heart and lungs via nerves. An electric shock often blocks this system so that the signals do not reach their destinations. Fortunately, our hearts have a driving center of their own and do not depend upon the signal from the brain. This is not true of the lungs. They must receive the signal to function.

If severe electric shock has sent sufficient current through the body to hold the heart contracted, the heart driven by its own center will resume beating when the circuit is broken. Artificial respiration should be started immediately to give the body opportunity to clear away the block so that signals once again reach the lungs. The victim then resumes natural breathing.

The sooner artificial respiration is started, the better the chance of recovery, as the human brain cells cannot live long without oxygen. Artificial respiration should be started promptly and should be continued until either the victim recovers or rigor mortis sets in. In one electric shock case on record, artificial respiration was needed for 8 hr before the victim breathed on his own.

The path the electric current follows through the body determines the injury. If the current does not flow through the trunk, and there are no vital organs in its path, the resulting injury is usually negligible, excepting possible burns. For example, a 220-v shock has been applied to 100 rats. Half received the shock from foreleg to foreleg and half from hind leg to hind leg. All rats that received the shock from foreleg to foreleg died. The others lived.

Shorter Duration, Better Chance

The shorter the duration of shock the better the chance of recovery. Should a victim be held frozen to the circuit for a number of seconds, the heat developed by the current may raise his body temperature to an excessive value that will prove fatal.

Electric burns are of two kinds. The true electric burn is characterized by a yellowish or pinkish area at point of contact. The burn from an arc chars skin and flesh.

Blisters and electrical burns result when the area of the contact is small, current density high, and current flows for a sufficient time. Blisters may be formed in 7 to 10 sec by contacts with 100-v circuits. Once formed they destroy any protection afforded by the skin and provide a low-resistance path for current to enter the body. If current density is high, some underlying tissues may coagulate. Care is essential in treating electrical burns, although usually they heal without infection.

If, as a result of contact with an electric circuit, an electric arc is formed, its high temperature may produce severe burns, similar to those caused by any intense heat source. Such burns also require careful treatment.

TRANSFORMER Treasure Hunt

General Electric offers a new transformer for oldest G-E unit in ASA range

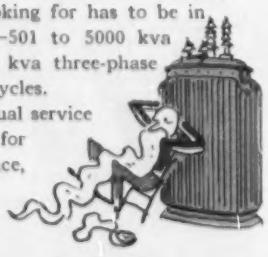
To promote the benefits of standardized transformers and to commemorate the dedication of its new Repetitive Manufacture transformer plant, General Electric plans a unique monument. The Company is sponsoring a "treasure hunt" to find the oldest G-E (or Stanley Electric) transformer in the RM range of ratings that was still in operation on May 11, 1954, the day the plant was dedicated. The prize, in exchange for the oldest unit, will be a new G-E self-cooled, oil-insulated transformer of equivalent rating delivered free of charge.

BONUS PRIZE FOR REPLACEMENT BY RM UNIT

If the winning transformer can be replaced with an RM unit having kva and voltage ratings and impedance values which are listed in the ASA standard, there will be an extra bonus in the form of an all-expenses paid trip to G.E.'s new Rome, Ga., plant for a man in the winner's organization.

WHAT TRANSFORMER WILL QUALIFY?

The transformer G.E. is looking for has to be in the ASA range of ratings—501 to 5000 kva single-phase, 501 to 10,000 kva three-phase 69,000 volts and below, 60 cycles. It must have been in continual service as of May 11, 1954—except for normal periods of maintenance, spare duty or relocation.



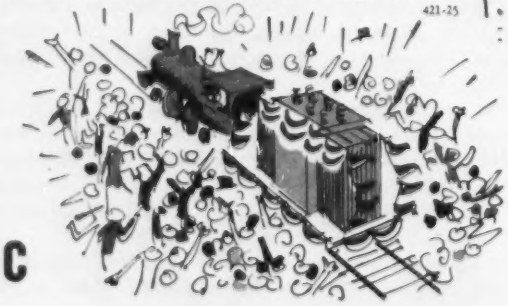
WHO CAN PARTICIPATE?

All electric utilities, manufacturing, and transportation companies are invited to take part in this nationwide transformer "treasure hunt."

HOW TO ENTER THE "TREASURE HUNT"

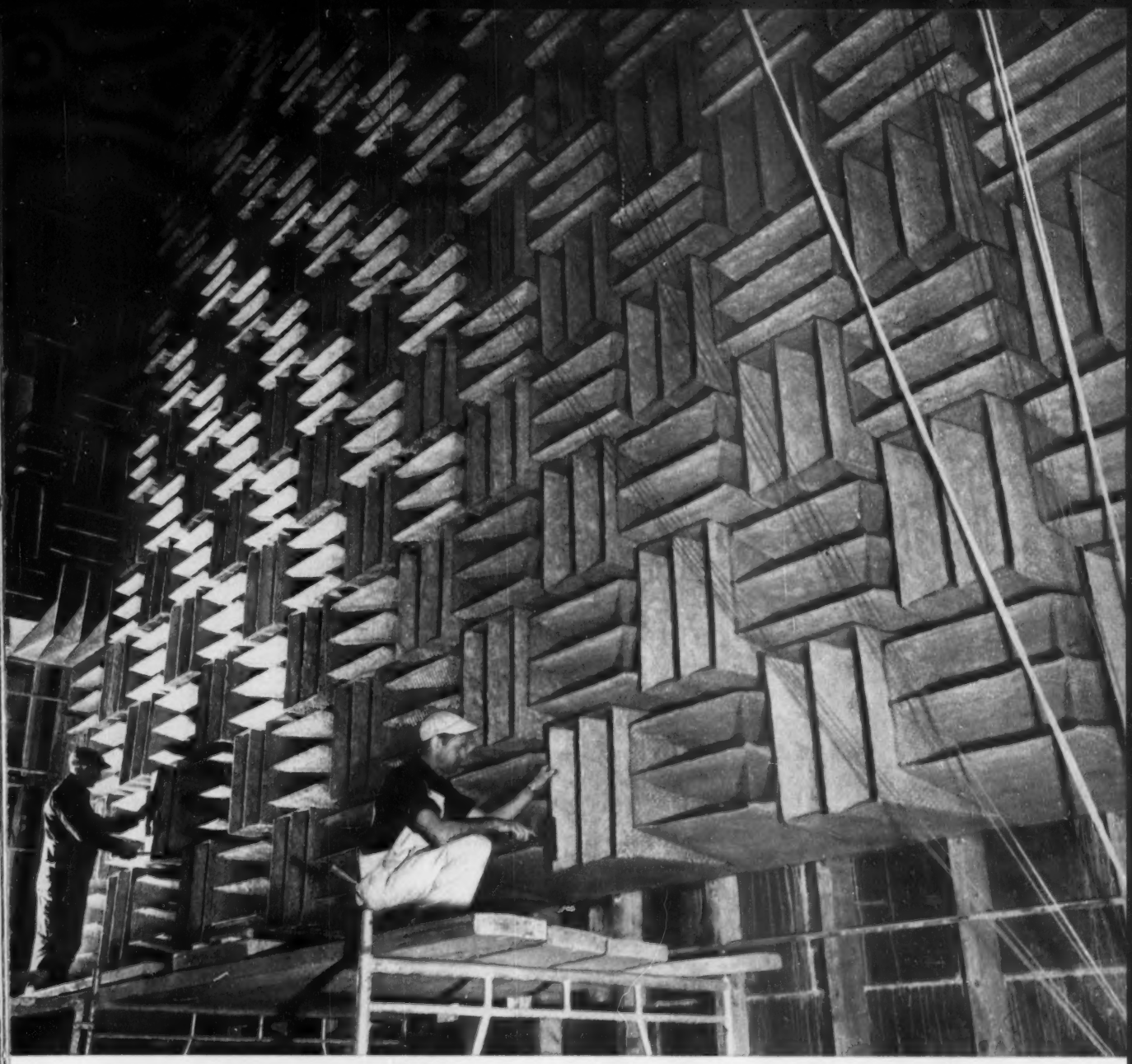
It's easy to enter the treasure hunt. It's fun. And it may be profitable. But, do it right away. Your entry must be post-marked not later than November 1, 1954. If you have a transformer "old timer" still in operation, why not ask your G-E Apparatus Sales Representative for a "treasure hunt" entry blank. Or write for Entry Form GEZ-1046. General Electric Company, Schenectady 5, N. Y.

421-25



Progress Is Our Most Important Product

GENERAL ELECTRIC



BEING BUILT TO BEAT NOISE

Workmen are putting the finishing touches on a new million-dollar tool to help rid transformers of objectionable noise. The new General Electric Sound Laboratory—56 feet wide, 66 feet long and 49 feet high—will be large enough to test any power transformer anticipated within the next decade.

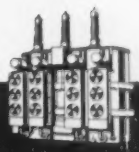
Sound-absorbing pattern shown above is made by 28-inch wedges of fiberglass. The 4½ foot thick walls also consist of concrete, masonry, copper shielding to keep out radio waves and a sound-absorbing-air space.

Located at Pittsfield, Mass., this new anechoic sound chamber will help pinpoint the causes of transformer noise more thoroughly than ever possible before and will aid our research engineers in their quest to lower noise levels without increasing costs to the user. General Electric Company, Schenectady 5, New York.

421-22

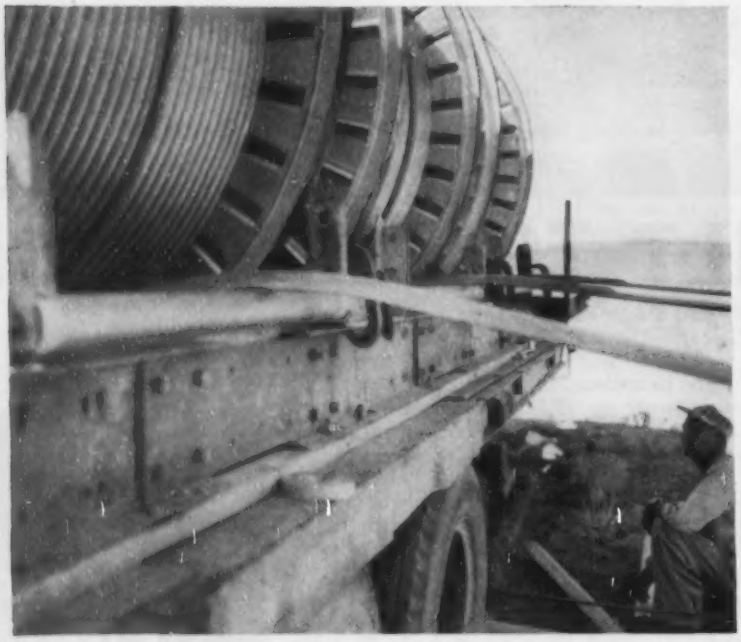
Progress Is Our Most Important Product

GENERAL ELECTRIC



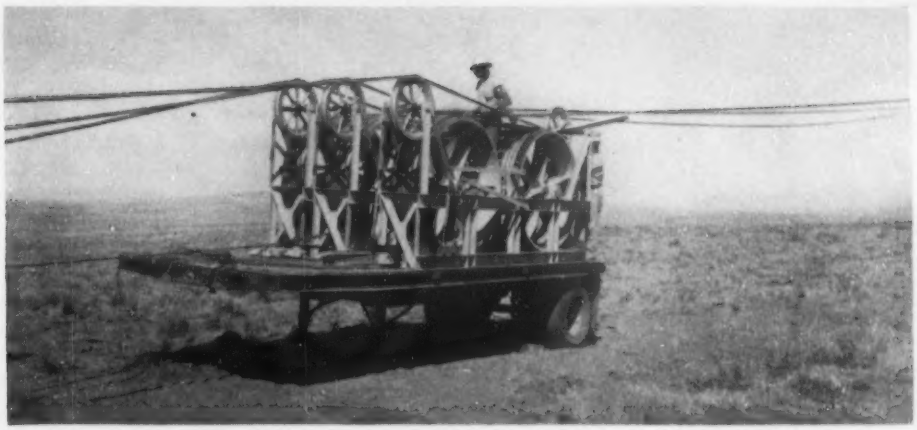
Power Transformer NEWS

STRINGING the first 90-mile section of BPA's McNary-Ross 345-kv line under tension prevented injury to the conductor by keeping it off the ground. Resulting smooth conductor surface is expected to help keep both corona loss and radio influence within tolerable limits



HARDWOOD ROLLERS on reel trailer protect the cable from abrasion. Five sets of three reels are used in each pull of about 22,000 ft, with 36,000 ft of stringing cable

HEXAGONAL DIES are used in hydraulic press to put sleeves on core and conductor



TENSION MACHINE has two large drums per conductor. In grooves around each drum are five lays of spiraled cable. Tension is held at 6,000 lb on each cable, and the wire reels are about 150 ft behind the machine

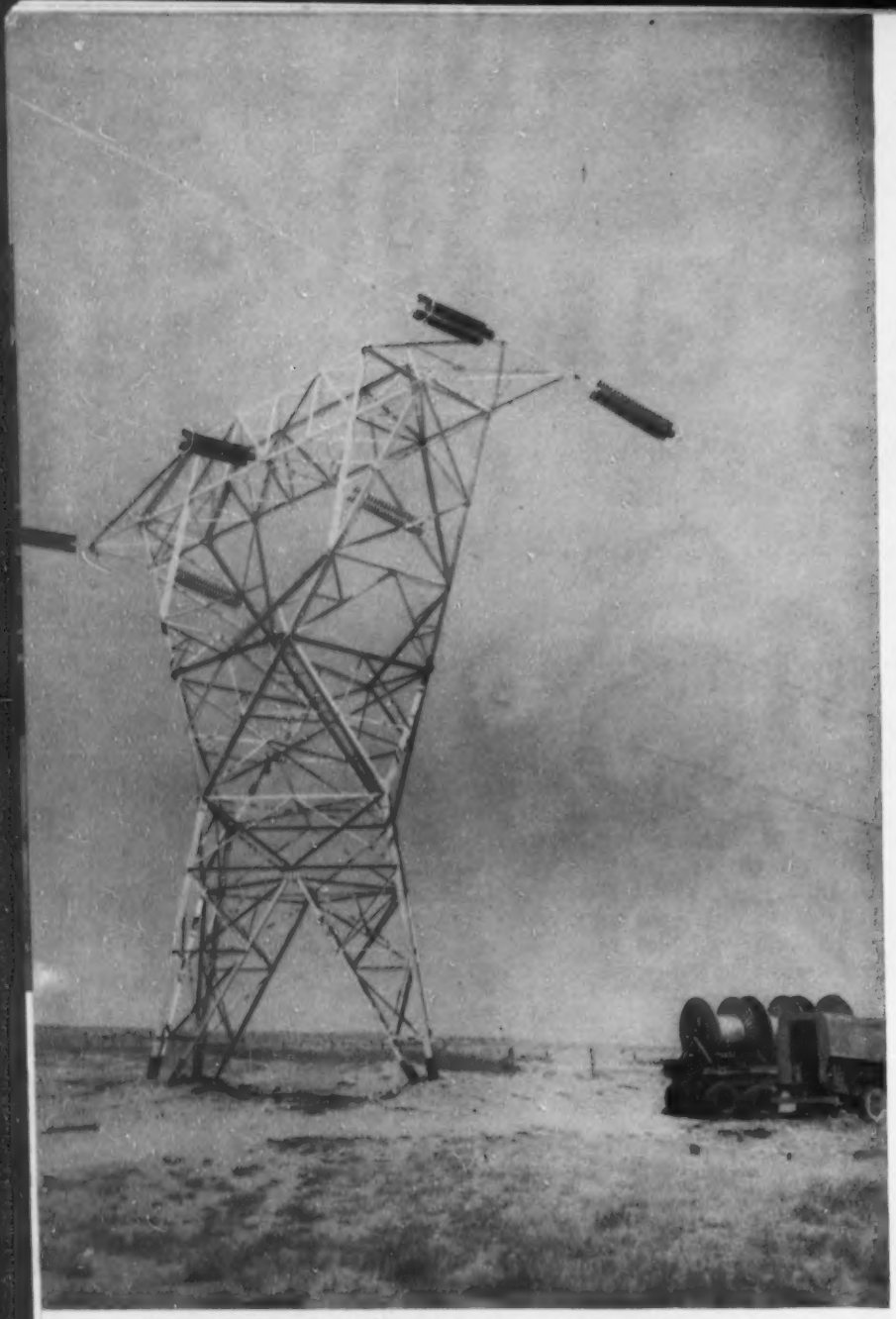
BPA Strings First 345-Kv Line

Particular precautions against nicks and abrasions are being exercised in the stringing of the first 345-kv transmission line in the United States. To keep the conductor surface smooth so that corona loss and radio influence will stay within tolerable limits, the first 90-mile section of Bonneville Power Administration's McNary-Ross line is being strung under tension. The contractors for the job elected to use tension stringing to meet the requirements that were set up by BPA.

Completion Set for December . . . The first 90 miles of the 176-mile line is a joint venture of Bay Construction, Inc, and Don L. Cooney, Inc, of Seattle, Wash. Construction started May 4 and is scheduled for completion by Dec. 1. Completion of the entire line and initial operation at 230 kv is set for November, 1955. Transformer in-

COMPLETED SPLICE is handled carefully to keep conductor off the ground, and the sharp corners on the splice are rounded off with a steel hand file

ARMOR ROD is installed with steel dies in wrench to help spiraling



DEADEND TOWER needs only jumpers to be complete. Deadends have triple, 21-unit strings of 25,000-lb, 10-in. insulators; the suspension towers, one 19-unit string. Sag is 35-40 ft

BPA Strings 345 kv Line (Continued)

stallations for operation at 345 kv are planned for early in 1956. Operating at 345 kv, this new transmission line will carry about 320,000 kw from McNary Dam to the Portland-Vancouver area.

Line construction is being carried on in several steps, beginning with the placing of tower footings. At the time of writing, over 80% of the footings were installed on the first section of the line. Steel is spotted at the tower sites and assembled into section. Final phase of tower erection is handled by a mobile crane with a 115-ft boom. Sections are raised and bolted into place.

Conductor stringing crews follow the tower erectors. They receive the conductor in lengths of about 4,400 ft on 42-in. steel reels. Cable consists of 1.602-in. diameter ACSR with a 19-strand core of 0.0874-in. diameter wires overlaid with an 84-strand conductor of 0.1456-in. diameter wires. It weighs about 2 lb per ft. Minimum bending radius for the cable is approximately 21 in.

Keeps Cable Off Ground . . . Stringing transmission lines under tension is a practice used only a few times in the past. But stringing under 6,000-lb tension is one way of assuring that conductors will not touch the ground at any time. Pulling in is done by tractor, with all three cables being pulled simultaneously. Average span lengths of 1,150 ft reduce the chances of conductors sagging to the ground. To prevent further this possibility, one crew travels along with the conductor where it is gripped by the pulling cable. When necessary, it places planks on any high ground under the conductor so that they will not touch the ground.

In one instance during construction, a two-mile section of conductor sagged to the ground after a clamp broke loose. It was necessary to smooth out with emery cloth all rough surfaces where the fall had abraded the aluminum.

Because this is the first section of 345-kv line to be built, Bonneville regards the methods used as somewhat experimental. While the general plan of construction will be followed in the future, ways will be sought continually to perfect and improve details of construction.

Install Armor Rod with Steel Dies . . . One new practice involves the use of a wrench with steel dies instead of aluminum for installing armor rod. A steel die makes spiraling of the 14 uniform rods of 0.436-in. diameter and 96-in. length much easier. Furthermore, the steel dies leave a smoother surface. Spherical clamps of 5-in. diameter are used at both ends of the rods. Oval tubular aluminum grading rings, furnished to BPA's designs by Ohio Brass Co, and Stockbridge vibration dampers, made by Alcoa, complete the conductor assembly at the suspension clamp.

Among problems encountered by construction crews on the Columbia River plain were temperatures above 100 F, rattlesnakes, and a powdery ground that swirls whenever a step is taken.

George W. Cooper, Manager, Protective Equipment Sales, holds L-M's old (left) and new (right) 6 kv valve type arresters, showing the difference in size.

Now L-M Makes Available a Lighter, More Compact Valve Type Arrester

Excellent characteristics remain unchanged in new easy-to-handle design of heavy-duty distribution arrester. Compact new Type E unit provides excellent protection and long life.

Years of experience and advanced study of lightning arrester requirements have led to the development by L-M engineers of a new, more compact valve type arrester. The new Type E is easier to handle and install; it requires less space on cross arms and stockroom shelves. Yet it has all the performance characteristics of the older units.

Precision Spark Gap provides optimum balance between 60-cycle and impulse sparkover characteristics; prevents unnecessary sparkover on harmless switching surges; yet provides instant response to assure full protection against dangerous lightning surges.

L-M's Exclusive Valve Element is molded right into the housing, assuring maximum discharge capacity and minimum IR drop. Exclusive lens-shaped electrodes molded into the element distribute surge currents uniformly throughout the valve material, to further insure high surge capacity and low IR drop.

Pyrex® Glass Housing permits visual inspection to detect mechanical or electrical damage.

Isolator gives positive assurance against grounding feeders. If the arrester should ever become damaged, the Isolator instantly disconnects the ground lead. This is another exclusive L-M feature.

L-M's new Type E arrester is available in 1, 3, 6, 9, 10, 12 and 15 kv ratings.

Ask For Complete Information

Ask the L-M Field Engineer for Bulletin LA2 on L-M's Type E arresters, giving specific information on arrester requirements, design, and performance; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Comparison of Old and New Designs Type E Arresters

Size	Weight		Height (including Isolator)	
kv	Old Lbs.	New Lbs.	Old In.	New In.
1	6.5	6.5	8½	9
3	8.5	6.5	11½	9
6	11.5	9.0	17¼	13½
9	15.0	11.5	22¼	18
10	15.5	12.0	23¼	19⅛
12	16.0	15.5	23¼	22½
15	18.0	18.0	28¼	27

202

LINE MATERIAL Lightning Arresters

Typical Procedures for Kyle Recloser Maintenance

Check mechanism to see if contacts close freely, are smooth and free from carbon. L-M offers a complete contact assembly which is pre-adjusted at the factory and very easy to install.

If linér shows signs of moisture such as blisters, or softness at bottom, it is an indication that the recloser may need drying out. The liner should be replaced or dried out when there are signs of moisture.

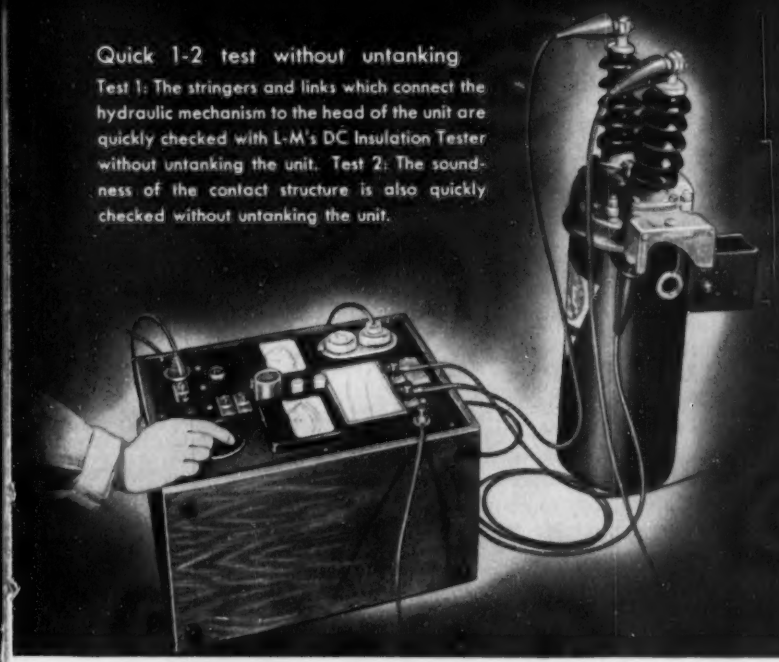
Clean tank with new oil and thoroughly wipe out carbon deposit. Refill with oil that has been hi-pot tested, whether new or reclaimed. (New oil may have absorbed moisture if the drum was left open for any length of time.)

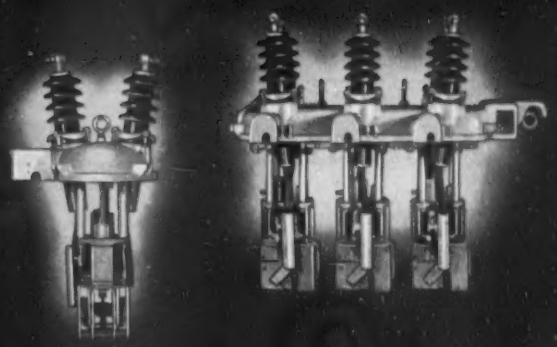
Clean mechanism, removing all carbon traces by wiping with clean, lint-free cloth, paying special attention to all insulating parts.

Before mechanism is replaced in tank, check and install a new head gasket, if necessary, to insure a good seal against moisture.

Quick 1-2 test without untanking

Test 1: The stringers and links which connect the hydraulic mechanism to the head of the unit are quickly checked with L-M's DC Insulation Tester without untanking the unit. **Test 2:** The soundness of the contact structure is also quickly checked without untanking the unit.





L-M's Insulation Tester is used to probe test the unit. With the recloser untanked and the frame removed from the stringers, all insulating members can be tested for high leakage current.

Take Advantage of Longest Practical Maintenance Cycle in Kyle® Reclosers

The maintenance cycle may be one, three, or more years, depending on climatic conditions and the duty imposed on the recloser. A method is given for determining frequency and simplifying maintenance.

by **R. C. KIRK**
Manager
Kyle Products Sales
Line Material Company

Many Kyle reclosers are still in operation after three, four, or more years without any maintenance. To assure dependable and continued operation, such reclosers should be checked. Kyle engineers recommend a program of spot checking reclosers, to determine the longest safe maintenance cycle for your operating conditions.

The length of time a recloser can be operated without maintenance depends on several factors. Collection of moisture, for example, is a result of time, loads, and climatic conditions. The collection of carbon is, of course, a result of the operating duty, i.e., the number of arc interruptions, magnitude of the current, voltage, and power factor of the fault current. These factors, involved in determining the recloser maintenance cycle, vary with each section of the country and with the operating duty imposed on the recloser. To obtain the longest practical maintenance cycle you should organize a program that meets your individual requirements.

One means of making a quick insulation check, without disassembling the recloser, is with L-M's new DC Insulation Tester. This is a highly efficient, low-priced portable unit that accurately determines the condition of insulation in reclosers and other apparatus.

If you find it necessary to replace the contacts on the recloser, it is advisable to replace the complete contact assembly, because this insures obtaining the proper setting of the contacts without calibration equipment. L-M makes available a complete contact assembly which is pre-adjusted at the factory and very easy to install. All the insulation parts as well as the contact assembly are shipped in a sealed plastic bag so that they will be protected from moisture in handling and storage.

Get The Facts On Maintenance

The L-M Field Engineer can help you with your maintenance problems. Discuss them with him—you'll find his advice helpful. Detailed maintenance instruction bulletins are available for Kyle reclosers, switches and sectionalizers. A bulletin that discusses factors determining the frequency of maintenance periods and how maintenance should be done is also available. Ask your L-M Field Engineer for these bulletins or write Kyle Products Division, Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Coils are vacuum-impregnated and shipped in oil-filled, sealed cans. L-M reclosers are so constructed that coils of different ampere ratings are interchangeable.

Other insulation parts as well as the contact assembly are shipped in sealed plastic bags to protect against moisture and dirt.

LINE MATERIAL Kyle® Reclosers

NEWS ABOUT PEOPLE

Smith Elected Executive VP . . .

. . . of Virginia Electric & Power Co. His successor as vice president and general manager is Erwin Will

M. C. SMITH

Virginia Electric & Power Co has elected M. C. Smith as executive vice president to fill the vacancy created by the recent retirement of William E. Wood (EW, Aug. 23, p 198). Erwin H. Will was appointed vice president and general manager to replace Executive Vice President Smith.

Vepco has also made these organizational changes in its system operating department.

Miles Cary, formerly manager of system operation for Vepco, was appointed operating manager of the utility.

ERWIN H. WILL

Other Appointments . . . The other new appointments include: R. M. Hutcheson, system manager-production; J. A. Rawls, system manager-transmission and distribution; T. E. Crossan, system superintendent-production; John McGurn, system superintendent-power supply; and T. S. Martin, system superintendent-transmission.

Smith, an electrical engineering graduate of the University of Maine, entered the utility field in 1912 when he joined Cape Breton Electric Co at Sydney, Nova Scotia. Later he became affiliated with Brockton & Plymouth Street Railway Co, Plymouth, Mass., Lowell (Mass.) Electric Light Corp, and Nova Scotia Tramways & Power Co, Halifax.

He became president of the Baton Rouge (La.) Electric Co in 1926. From 1931 to 1936 he was president of the El Paso (Tex.) Electric Co, leaving there to become vice president of Vepco. He was elected vice president and general manager of Vepco in 1950.

President of PUAV . . . Will started with Vepco in 1922. After filling several engineering posts, he left the utility in 1935 to join El Paso Electric, advancing to become its president. He returned to Vepco in 1947 as general manager of operations and three years later was elected vice president of operations. Will is now serving as president of the Public Utilities Association of the Virginias (EW, Nov. 9, 1953, p 29).

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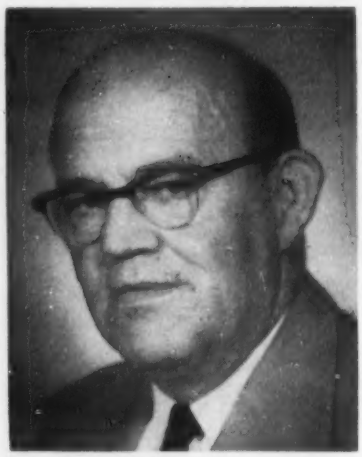
Robert E. Minshall has been named assistant to the commercial manager of Columbus & Southern Ohio Electric Co. For the past several years, he has served as director of press relations for the utility.

Thomas R. Lawson has been made sales manager for Westinghouse Electric Corp's Sunnyvale, Calif., plant. In this newly created post, Lawson will be responsible for overall co-ordination of commercial activities of the plant. Lawson comes from Westinghouse's Pittsburgh headquarters, where he was assistant sales manager of industrial products. He joined Westinghouse in 1928.



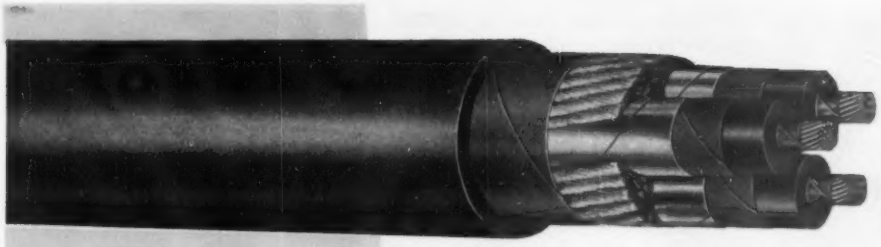
CHARLES F. MONNIER

Niagara Mohawk Names Monnier Operations VP

Charles F. Monnier has been elected vice president in charge of operations for Niagara Mohawk Power Corp, Syracuse, N. Y.

Monnier's association with the Niagara Mohawk System dates back to 1927 when he entered the operating department in Schenectady. In 1931 he was named assistant superintendent of substations in Albany district, and in 1933 became superintendent of power supply in the Glens Falls district. Later he was assistant electric distribution superintendent in the Gloversville district, returning to Albany as superintendent of underground distribution in 1936.

He was named superintendent of electric distribution in Albany in 1939. In 1940 he assumed the post of assistant to the chief engineer in Albany, becoming in that same year superintendent of electric operations for the division. In 1951 he was named general operating superintendent responsible for electric and gas operations in the Niagara Mohawk Power's Eastern Division.

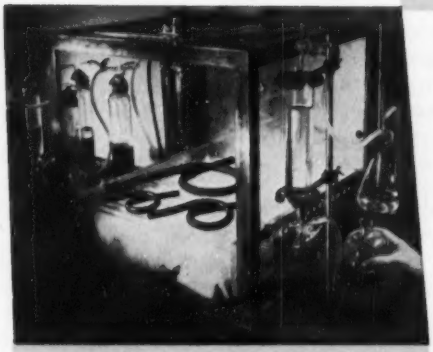


4 AWG Stranded 3/C RoZone insulated, shielded, RoPrene sheathed power cable, 5000 Volts.

Do It Better—Do It Electrically
National Electrical Week, October 18-25

Rome RoZone®

Superior Ozone-Resistant Insulation Deserves Your CONFIDENCE



How Rome Cable Tests Ozone Cutting
Ozone resistance of insulating compounds is determined in an ozonizer. Specimens are subjected to ozone atmosphere of prescribed concentration. To see what happens note specimens below.

What Ozone Does to Cable Insulation

Unretouched photo of conventional rubber specimen after short-time ozone test.

Unretouched photo of RoZone specimen after long-time ozone test.

What Its High Ozone Resistance Means to You

Q: What is ozone?

A: Ozone is activated oxygen, a gas resulting from corona discharge, a phenomenon which may occur in the distribution and generation of high voltage electricity.

Q: How does it affect cable insulation?

A: Ozone, an enemy of conventional rubber compounds, causes accelerated cracking and embrittlement of cable insulation. The result . . . early cable failure.

Q: What does RoZone's high resistance to ozone mean to you?

A: First and most important, it protects you against cable failure due to ozone cutting . . . assures you of long-time dependability of service. With the power and control cables amounting to as little as 1 or 2 per cent of total generating station investment, you cannot afford to risk shut down of facilities by sacrificing insulation quality.

Further, RoZone is a type of insulation which has behind it better than 75 years of dependable performance. By independent laboratory tests, it exceeds all industry specification requirements.

While ozone cutting is a natural hazard of high voltages, low voltage failure is often traced to ozone cutting because of adjacency to rotating equipment or high voltage lines. RoZone, therefore, is your best protection *regardless of voltage classification.*

Approved by the country's leading consulting engineers for its well-balanced properties, RoZone merits your confidence for all high and low voltage work where dependable, long service life is paramount. We will be glad to send independent test data upon request.

RoZone is approved and accepted by leading utilities, industrials and consulting engineers.

ROME CABLE
Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE ROME, N.Y.

H. B. COHN

Cohn Is Appointed a VP of American G&E Service

H. B. Cohn, chief counsel of American Gas & Electric Service Corp, has been named a vice president of the firm. In addition, Cohn and F. A. Lane, deputy chief engineer, have been elected directors.

As vice president and director, Cohn replaces C. E. Moore, who retired June 30 and whom the former succeeded on that date as chief counsel. The other board vacancy was created by the retirement last June of Graham Claytor, executive vice president.

Formerly an attorney with the Securities and Exchange Commission, Cohn joined the service corporation's legal department in 1948. A native of New York, he was graduated from Yale University in 1933 and from Harvard Law School in 1936.

•

Earl W. Williams, formerly assistant treasurer of Electric Storage Battery Co, Philadelphia, has been elected treasurer of the company. In another appointment, **Edward J. Dwyer,** assistant secretary, was advanced to the post of secretary. Williams became affiliated with Electric Storage in 1923 and Dwyer in 1941.

Nicolas N. Smeloff has retired as system planning engineer for Pennsylvania Power & Light Co. He will be replaced by **C. A. Carpenter,** formerly assistant system planning engineer. Smeloff, an electrical engineer, joined Pennsylvania P&L in 1921. A veteran of 29 years with PP&L, Carpenter became Smeloff's assistant in 1942. Both Smeloff and Carpenter have participated in committee activities of Pennsylvania Electric Association.

HOWARD JACKSON CHARLES S. KERNAGHAN RICHARD G. ROBBINS

Hubbard & Co Appoints 3 New VP's

Hubbard & Co, Pittsburgh, Pa., has announced the following executive appointments and promotions: Howard Jackson, who has been in charge of production for the firm's Chicago plant, was promoted to vice president in charge of production at the Pittsburgh and Chicago plants. Charles S. Kernaghan, formerly a vice president of Waterman Pen Co, was elected vice president in charge of merchandising and assistant to the president. Richard G. Robbins, vice president of Hubbard's Eastern Division, was advanced to vice president and general sales manager of the Pittsburgh and Chicago plants.

The company also promoted Alton R. Smith, an assistant superintendent at the Chicago plant, to the post of works manager at that plant. John Winke was appointed assistant works manager to Smith.

W. M. WADE

Alabama Power Reassigns Wade to Its Western Unit

W. M. Wade, vice president of Alabama Power Co's Southeast Division, has been made vice president of the utility's Western Division. He succeeds Henry Maulshagen, who has retired.

Wade, who graduated from Clemson College with an engineering degree, began with Alabama Power as a construction engineer in 1924. In 1932 he took over utility's street railway system at Montgomery.

He later became district engineer and superintendent of the Phenix City district, then assistant superintendent and superintendent of the Southern Division. He was district manager at Gadsden for nine years before becoming Southeast Division vice president in 1952.

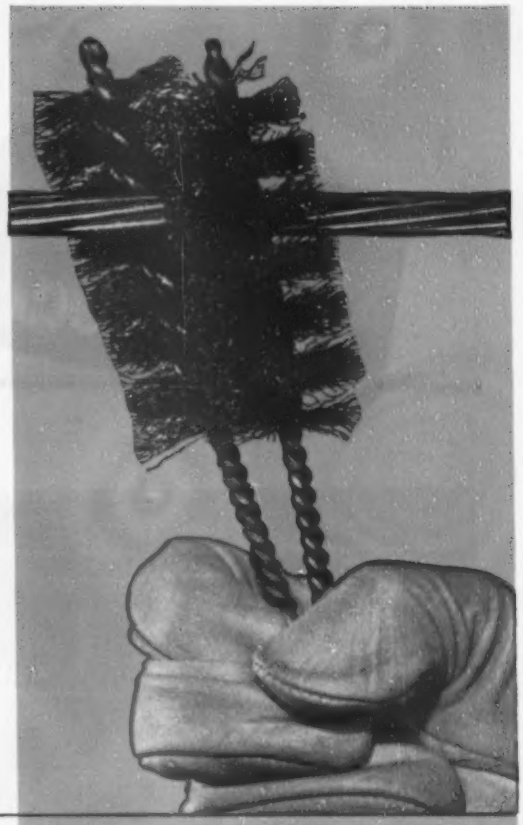
Maulshagen, who will remain at Tuscaloosa until Nov. 1 as a consultant, served for a number of years as manager of the Western Division with headquarters in Birmingham prior to assuming the divisional vice presidency in 1941. He has worked with the utility since 1914, except for employment with Westinghouse Electric Corp in 1916-17 and Sloss-Sheffield Steel & Iron Co in 1920-1921.

OBITUARY

E. C. Hardesty, 64, superintendent of construction for the Western Division of the Kentucky Utilities Co, Lexington, Ky., died Aug. 19 in Earlington, Ky. He had been associated with KU for the past 40 years.

For Profitable, Maintenance-Free Construction

Make CLEAN CONNECTIONS with a KEARNEY Conductor Cleaning Brush



Just a few, fast strokes of this specially designed, "V"-shaped brush quickly cleans off the most stubborn corrosion and foreign matter . . . even between conductor strands. KEARNEY CONDUCTOR CLEANING BRUSHES are available with a sure-grip Insulated Metal handle, or with a universal fitting for all Fit-On poles. As they are used, the brushes can be easily rotated, or replaced when necessary.

Keep CONNECTIONS CORROSION-FREE with KEARNEY AIRSEAL

It's just a matter of seconds to *permanently* seal every connection from moisture, oxidation and corrosion with this pliable, hand-moulded compound. KEARNEY AIRSEAL's high dielectric strength makes it particularly outstanding as both an anti-corrosion seal and insulator, even on underground applications. Hot, cold, wet or dry, AIRSEAL will not age or deteriorate. It always remains pliable and tight.

Write Today for Prices and Quantity Discounts.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Ave. St. Louis 10, Missouri

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Kearney Products

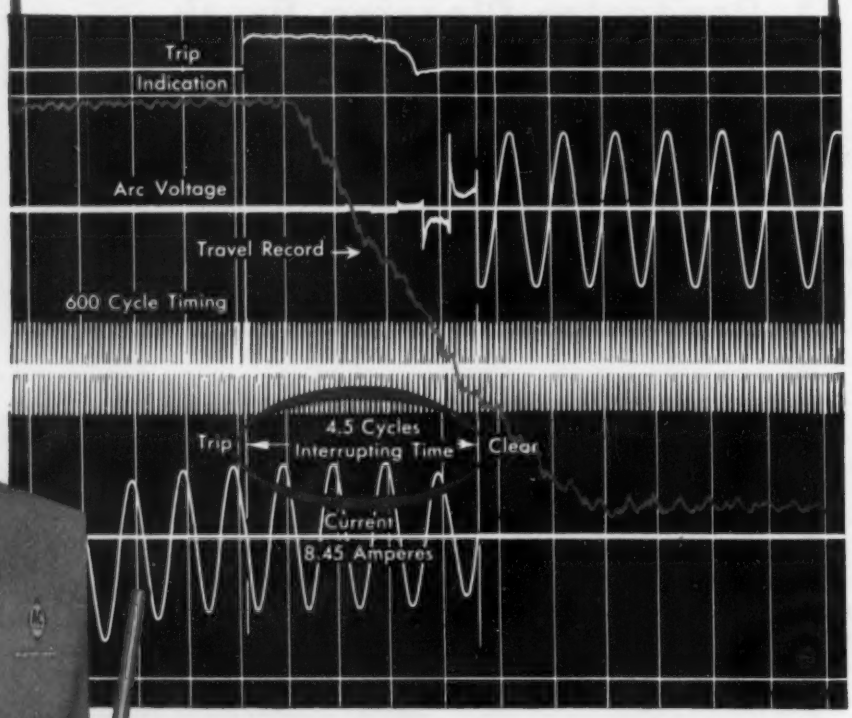
For Better Construction SAFER Maintenance!

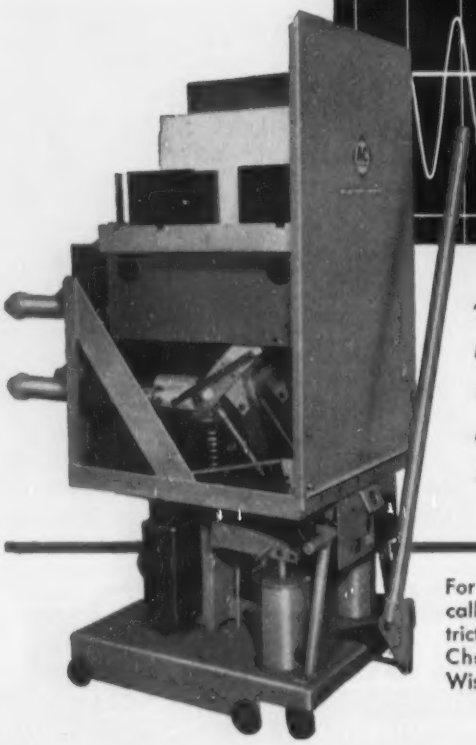
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

ALLIS-CHALMERS
PROGRESS IN
Switchgear

Here's ON NEW 13.8-kv METAL-

FAST ON LOW CURRENTS



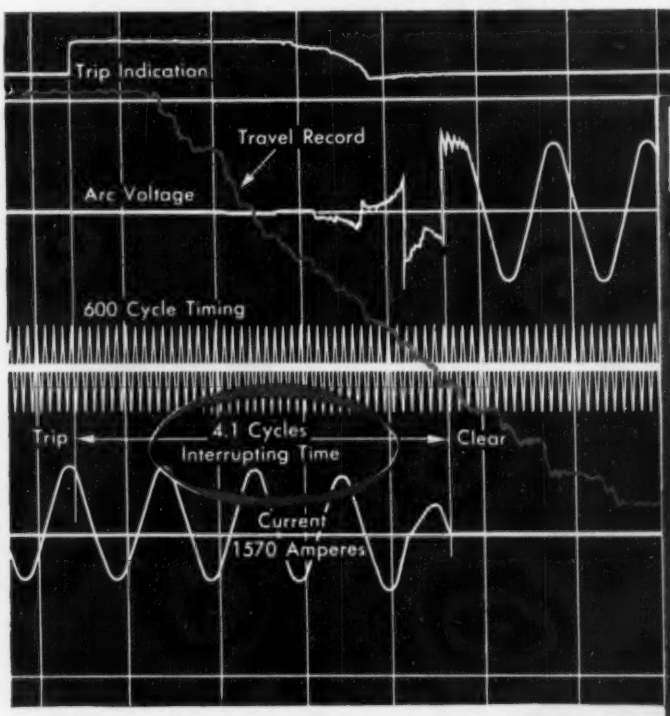


4.5 cycle and 4.1 cycle interruptions shown here are well within 8 cycles allowed by the ASA standards for even heavy currents. Low current switching··· always considered difficult··· now handled easily. Horizontal contact separation plus effective puffer design make this possible.

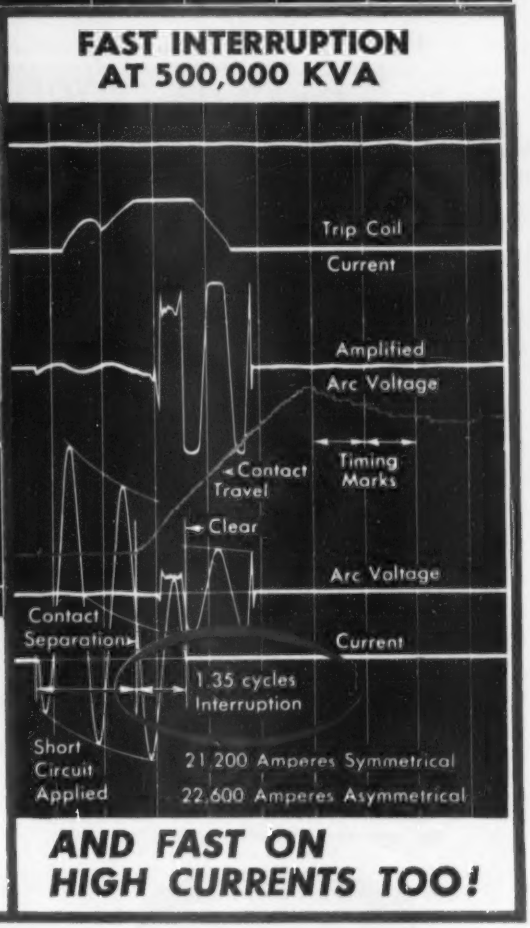
For additional information, call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4288

ALLIS-

Proof OF FAST INTERRUPTION
BREAKER for CLAD SWITCHGEAR



New breaker also has high speed 4-bar mechanism··· "blow-on" contacts ··· and sectionalized arc chute assembly that can be lifted off by one man.



CHALMERS

A-C ALLIS CHALMERS

A STATION ENGINEER ASKS—

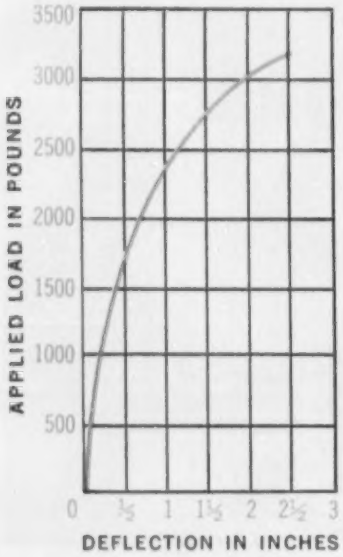
"Why is it necessary to shim 69 K.V. switch units ?"

Here's the ANSWER: *You don't have to when you use Pinco L-6069 Switch and Bus Units.*

Here's WHY:

The Pinco L-6069 Switch and Bus Unit employs a ribbed malleable iron pin to give it the rigidity and strength required in this unit's application.

Here's the PROOF: The deflection curve below shows the rigidity of the Pinco L-6069 Switch and Bus Unit under various loads. The secret of Pinco's perfect alignment even when horizontally mounted, lies in the balanced design of the porcelain and hardware.



SPECIFICATIONS

PINCO L-6069
SWITCH and BUS UNIT

Cantilever Strength, upright (Base mounted)	1500 lbs.
Cantilever Strength, underhung (Cap mounted)	1000 lbs.
Torsion Strength	15,000 inch lbs.
Tension Strength	12,000 lbs.

This Unit More Than Meets The Above Ratings

SEE PAGE 116, PINCO CATALOG NO. 49 FOR COMPLETE ELECTRICAL AND MECHANICAL CHARACTERISTICS

PINCO INSULATORS

RIGHT ON THE JOB!

The Porcelain Insulator Corporation
766 Main St., Lima, N. Y.

Columbia River Plan Drafted

Public power group studies proposals for federal development corporation to take over BPA and U. S. hydro projects

Members of the Northwest Public Power Association are studying the preliminary draft of a bill, proposed for introduction in the next session of Congress, for creation of a Columbia River Development Corporation. The bill is being drafted in accordance with a resolution passed by the association at its March convention.

The bill calls for a government corporation to take over the Bonneville Power Administration and all federal hydroelectric projects in the Pacific Northwest, with 50 years to pay off the government's remaining investment. The proposed corporation would be authorized to issue revenue bonds for new projects, to be purchased by the Treasury, as in the St. Lawrence Seaway Development Corporation Act recently approved by President Eisenhower.

Original proposals called for a five-man management board, with one member to be named by the President and the others to be elected or appointed from each of the four Pacific Northwest states, but present sentiment favors an administrator to be appointed by the President, with a 15-member advisory council to be named by the governors of Washington, Oregon, Idaho, and Montana.

Gus Norwood, executive secretary of the association, points out that the proposed bill "is not a CVA or an inter-state compact" and does not seek to displace the Army Corps of Engineers or the Bureau of Reclamation as construction agencies. The corporation, although "within the federal orbit," would be an interest-paying borrower from the Treasury, he declared.

Wiring Not Responsibility of Utilities, Meeting Told

The major responsibility and cost for the adequate wiring program have been put on the wrong segment of the electrical industry, asserted Paul. P. Ashworth, general manager and chief engineer, Telluride Power Co, Richfield, Utah. Speaking before a recent joint session of the Intermountain Electrical Association and the Utah Chapter of International Association of Electrical Inspectors, he said manufacturers, distributors, dealers, contractors, and builders should take the initiative.

Electric utilities, while realizing the need for such a program, must devote their energies to immediate problems, he said. It remains for those who profit most to promote adequate wiring, with a fair measure of cooperation from the utilities and others who stand to benefit. "While the electrical industry and the builders could profit tremendously by adequate wiring, the public would be the principal beneficiary," concluded Ashworth.

MEETINGS CALENDAR

INTERNATIONAL ELECTROTECHNICAL COMMISSION
50th Anniversary Meeting, University of Pennsylvania, Philadelphia, Sept. 1-16.

ROCKY MOUNTAIN ELECTRICAL LEAGUE
Annual Fall Convention, Stanley Hotel, Estes Park, Colo., Sept. 12-15.

ILLUMINATING ENGINEERING SOCIETY
National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., Sept. 13-17; Pacific Northwest Region Conference, Harrison Hot Springs, British Columbia, April 25-26, 1955.

INSTRUMENT SOCIETY OF AMERICA
1st International Instrument Congress-Exposition, Philadelphia, Sept. 13-24.

***PUBLIC INFORMATION PROGRAM**
Steering Committee, Hotel Roosevelt, New York, Sept. 14; Inter-Regional Committee, Blackstone Hotel, Chicago, Sept. 24; Annual Workshop Conference, Chase and Park Plaza Hotels, St. Louis, Oct. 27-29; Mid-Atlantic Region, Hotel Statler, Washington, D. C., Nov. 12.

***PENNSYLVANIA ELECTRIC ASSOCIATION**
47th Annual Meeting and Business Conference, William Penn Hotel, Pittsburgh, Sept. 14-15; Fall Meeting, Systems Operation Committee, Alexander Hotel, Hagerstown, Md., Oct. 7-8; System Planning Committee, Lehigh Valley Club, Allentown, Pa., Oct. 11-12; Fall Meeting, Relay Committee, Hotel Alexander, Hagerstown, Md., Oct. 14-15; Fall Meeting, Electrical Equipment Committee, Hotel Robert Treat, Newark, N. J., Oct. 19-20.

PUBLIC UTILITIES ASSOCIATION OF VIRGINIAS
36th Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 16-18.

***EDISON ELECTRIC INSTITUTE**
Commercial Section Committee Meeting; Street Lighting Committee, Haddon Hall, Atlantic City, Sept. 15; Industrial Power and Heating Section Committee Meetings: General Power and Heating, Competitive Service, and Industrial Sales Methods and Development. All to be held at EEI Headquarters, New York, Sept. 16-17; Farm Section Committee Meetings: Agricultural Development, Farm Sales Promotion, Farm Utilization, Rural Youth. All to be held at Roosevelt Hotel, New York, Sept. 16-17; Dealer Co-ordination Committee Meeting, EEI Headquarters, New York, Sept. 16-17; Accident Prevention Committee, Benjamin Franklin Hotel, Philadelphia, Sept. 20-21; Residential Promotional Committee Meeting, EEI Headquarters, New York, Sept. 27-28; Industrial Relations Committee, Round Table Conference, Palmer House, Chicago, Sept. 27-29; Meter and Service Committee, Leland Hotel, Springfield, Ill., Sept. 27-29; EEI-AGA Tax Committee, Brown Palace Hotel, Denver, Colo., Sept. 29-Oct. 1; Prime Movers Committee, De Witt Clinton Hotel, Albany, N. Y., Oct. 4-5; Area Development Workshop, Hotel Statler, Cleveland, Oct. 7-8; Transmission and Distribution Committee, Sir Francis Drake Hotel, San Francisco, Oct. 7-8; Electrical Equipment Committee, Hotel Statler, Hartford, Conn., Oct. 11-12; Commercial Division General Committee Meeting, EEI Headquarters, New York, Oct. 15; Industrial Relations Committee in conjunction with North Central Electrical Association, Minneapolis, Minn., Nov. 18-19; Prime Movers Committee, Astor Hotel, New York, Nov. 29-30; Industrial Relations Committee, EEI Headquarters, New York, Dec. 16; 1st Street Tree and Utility Conference, co-sponsored with EEI Transmission and Distribution Committee and Street Lighting Committee of Illuminating Engineering Society, Wade Park Manor, Cleveland, March 3-5, 1955; Sales Conference, Edgewater Beach Hotel, Chicago, March 28-31, 1955; Annual Convention, Statler-Biltmore Hotels, Los Angeles, June 13-16, 1955.

MISSOURI VALLEY ELECTRIC ASSOCIATION
Accounting Conference, Jefferson Hotel, St. Louis, Sept. 23-24; Sales and Rural Conference, President Hotel, Kansas City, Mo., Oct. 6-8; Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 3-4, 1955; Engineering Conference, President Hotel, Kansas City, Mo., March 23-25, 1955.

SOUTHEASTERN ELECTRIC EXCHANGE
Engineering and Operation Section, Thomas Jefferson Hotel, Birmingham, Ala., Sept. 23-24; Accounting Section, Roanoke Hotel, Roanoke, Va., Oct. 21-22; General Sales Conference, Roosevelt Hotel, New Orleans, La., Oct. 28-30; Accident Prevention Committee, Heidelberg Hotel, Baton Rouge, La., Nov. 11-12; Annual Meeting, Boca-Raton Hotel and Club, Boca Raton, Fla., March 21-23, 1955; Engineering and Operation Section, Roosevelt Hotel, New Orleans, La., April 7-8, 1955.

ATOMIC INDUSTRIAL FORUM, INC
Meeting on "What the New (Atomic) Law Means", Hotel Plaza, New York, Sept. 27-28; Meeting on "Atomic Opportunities in New England", in conjunction with New England Council, Statler Hotel, Boston, Oct. 20.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Committee on Petroleum, Conference on Electrical Applications in Petroleum Industry, Mayo Hotel, Tulsa, Okla., Sept. 27-29; Middle Eastern District Meeting, Abraham Lincoln Hotel, Reading, Pa., Oct. 5-7; Fall General Meeting, Morrison Hotel, Chicago, Oct. 11-15; Winter

(*Continued on page* 60)

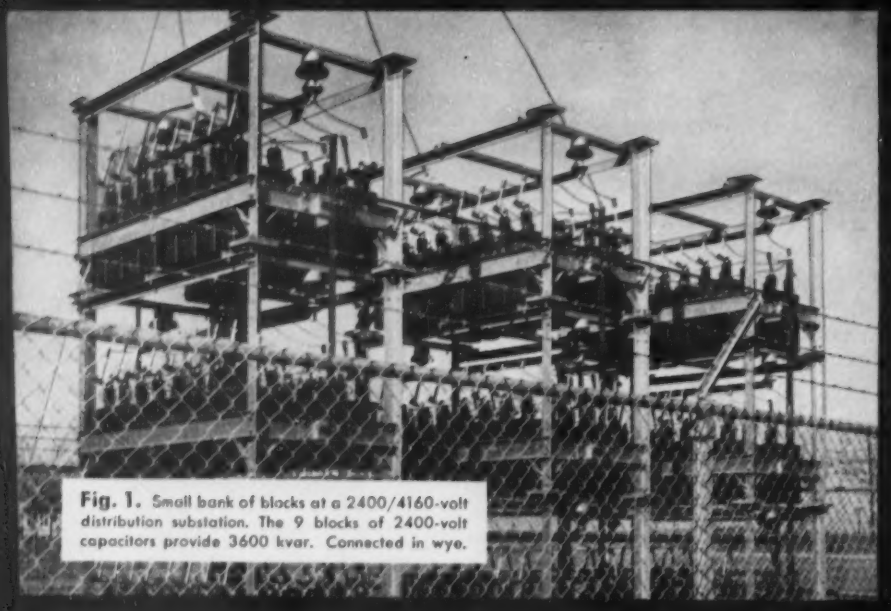


Fig. 1. Small bank of blocks at a 2400/4160-volt distribution substation. The 9 blocks of 2400-volt capacitors provide 3600 kvar. Connected in wye.

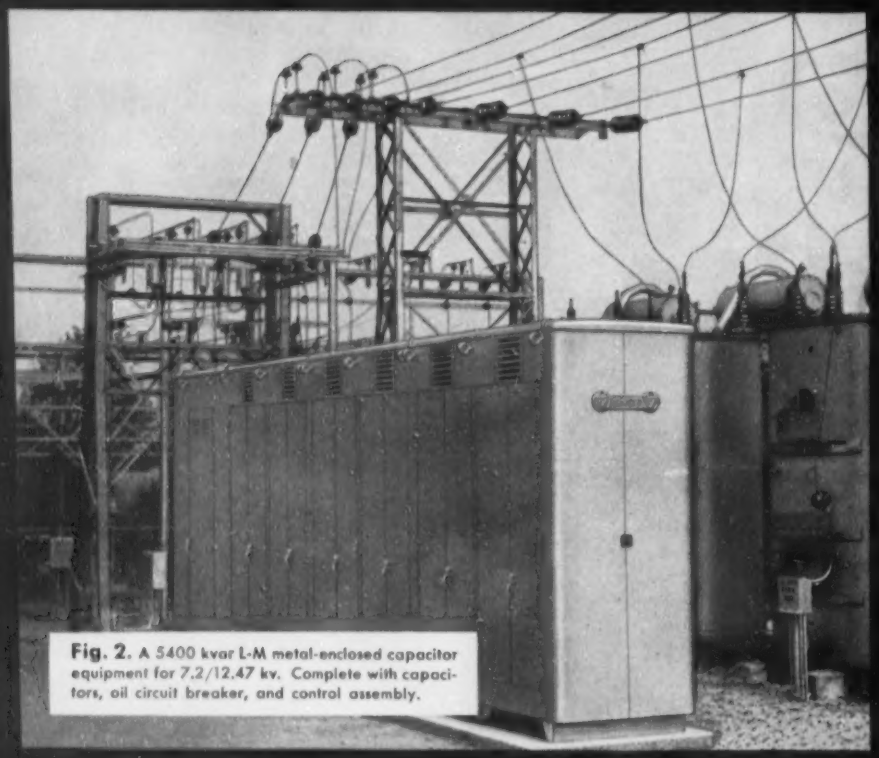


Fig. 2. A 5400 kvar L-M metal-enclosed capacitor equipment for 7.2/12.47 kv. Complete with capacitors, oil circuit breaker, and control assembly.

Fig. 3. A 300 kvar switched capacitor rack serving a suburban area. Note the simple, compact arrangement and accessibility of the entire assembly.

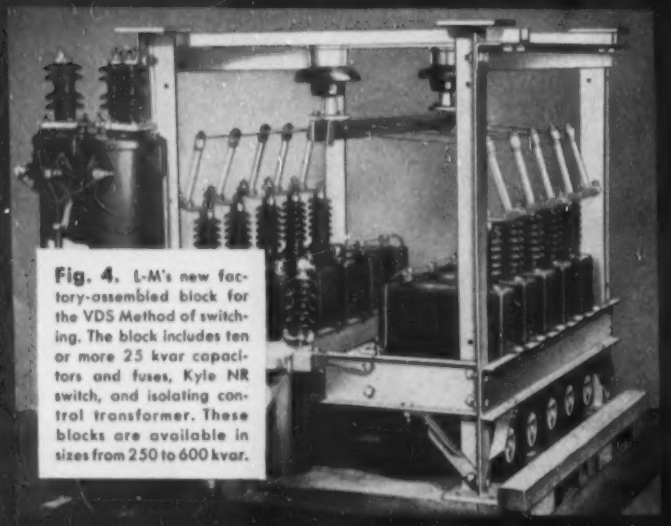
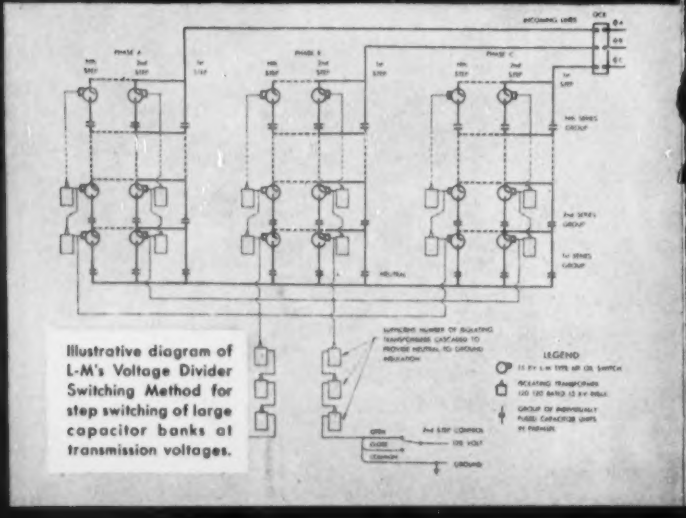


Fig. 4. L-M's new factory-assembled block for the VDS Method of switching. The block includes ten or more 25 kvar capacitors and fuses, Kyle NR switch, and isolating control transformer. These blocks are available in sizes from 250 to 600 kvar.



Illustrative diagram of L-M's Voltage Divider Switching Method for step switching of large capacitor banks at transmission voltages.

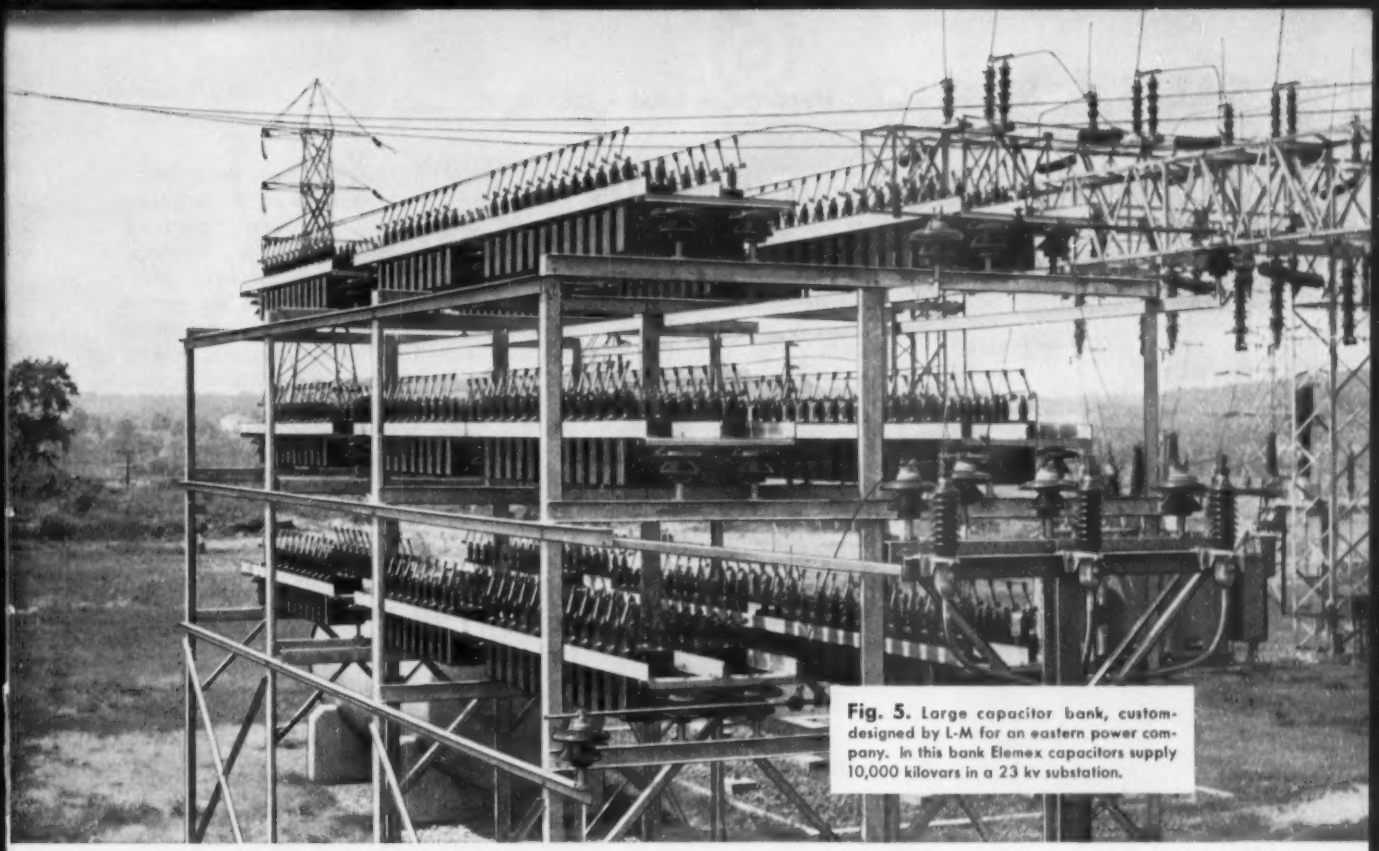


Fig. 5. Large capacitor bank, custom-designed by L-M for an eastern power company. In this bank Elemex capacitors supply 10,000 kilovars in a 23 kv substation.

L-M Offers Completely Engineered Capacitor Bank Installations

L-M's service includes a full line of equipment and experienced custom designing of any size of bank for transmission or distribution lines.

By **N. K. DELANEY**
Manager of Capacitor Sales
Line Material Company

The application of capacitors to distribution and transmission lines requires careful consideration of both electrical and economic factors. A large amount of information on equipment, protective schemes and cost must be available to the utility engineer for an intelligent decision.

Line Material Company is prepared not only to supply you with such information, but also to cooperate with utility engineers in working out the most satisfactory capacitor-application designs. This includes the best possible protective and step-switching schemes for any size and type of bank for operation at transmission or distribution voltages.

L-M's complete line of capacitor equipments includes pole-mounted racks factory-assembled blocks, metal-enclosed equipments, and custom-designed field-assembled banks.

Another and exclusive service to the industry is the L-M Voltage Divider Switching Method (patent applied for). This is an automatic switching scheme for large multi-step capacitor banks at transmission voltages. It involves substituting a number of low-cost 15 kv oil switches for the large circuit breakers on all but the first step on multi-step banks up to 230 kv. The VDS Method saves about 40% of the cost of breakers alone. A special block assembly has been designed to simplify installation of the VDS Method.

Ask Us For Complete Information

We would appreciate an opportunity to tell you about our products, and about our Capacitor Bank Engineering Service. Ask the L-M Field Engineer to discuss it with you; or write Capacitor Sales, Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

L-M Capacitor Equipments

Factory-assembled blocks in complete range of NEMA-standard sizes and ratings. Blocks save time and money in assembling large banks. (Fig. 1)

Metal-enclosed capacitor equipments in all NEMA-standard distribution voltage sizes and ratings. (Fig. 2)

Factory-assembled racks for pole-mounted banks. Sizes with 15 kv spacing up to 300 kvar switched and 375 kvar unswitched assemblies with 25 kvar units. (Fig. 3)

VDS Method factory-assembled block for large multi-step capacitor banks, an L-M-exclusive method that reduces costs of switching equipment. (Fig. 4)

Custom-designed field-assembled banks with recommendations for the protective and switching schemes. (Fig. 5)

LINE MATERIAL

Elemex® Capacitors

Traveling Heat Pump Sells

AP&L'S HEAT PUMP is drawing heavy residential, commercial customer interest in system tour. Leslie Blades of AP&L shows unit

As many as one to five definite sales at each stop has been the score chalked up by the traveling heat pump exhibit now making the rounds of major offices in the Arkansas Power & Light Co territory.

Transported on a small trailer, the heat pump is drawing crowds, interest and sales wherever it makes an appearance. Thus far it has been shown in eight AP&L towns with 20 more scheduled before the tour ends. The company estimates that each exhibit of the unit to date has resulted in as many as one to five definite sales within the next season. Most of the interest shown so far has been by persons constructing new homes. But, says AP&L, several commercial establishments with humidity control problems such as printing shops and funeral homes also have indicated interest.

Appropriate advertising and publicity heralds the coming of the heat pump in each town on the tour route. Five days before the unit arrives a publicity story and mat is sent to the local newspaper. A four-col, 4-in ad is inserted in the paper the first day of the exhibit, and up to a week is alloted for the show's running time in each town. An AP&L air conditioning specialist is on hand at least one day of each showing with local office personnel available throughout the showing to answer questions.

The utility already is highly enthusiastic about the results of its traveling heat pump even though the tour barely has gotten a good start. "We believe the exhibit is helping tremendously to dispel the idea that the heat pump is still in the experimental state," says the company. "It offers the heat pump as a heating and cooling unit of **today** ready for installation and good service."

Code Amendment Slated for Air Conditioning

Standards governing the grounding and wiring of air conditioning units are contained in a new interim amendment to the National Electrical Code released by the Code Committee secretary.

On grounding, the amendment provides that: "Exposed non-current-carrying metal parts which are liable to become energized shall be grounded under one or more of the following conditions: if permanently connected to metal-clad wiring; if in a wet location and not isolated; if within reach of a person standing on the ground outside of a building; if in a hazardous location; if in electrical contact with metal or metal lath and if more than 150 volts to ground."

On branch circuit requirements, it declares that:

"1. The total load of motor operated air-conditioning equipment shall not exceed 80% of the rating of a branch circuit which does not supply lighting units or other appliances;

"2. The total load of air-conditioning equipment shall not exceed 50% of the rating of a branch circuit if lighting units or other appliances are also supplied."

The new interim amendment is to be included in the 1954 printing of the 1953 National Electric Code to be published in September by the National Fire Protection Association. However, it is subject to further consideration by the Code Committee and official action by the Association before it is included in the Code's next general revision.

As Interim Amendment No. 101, it will become effective Jan. 1, 1955, the committee secretary said.

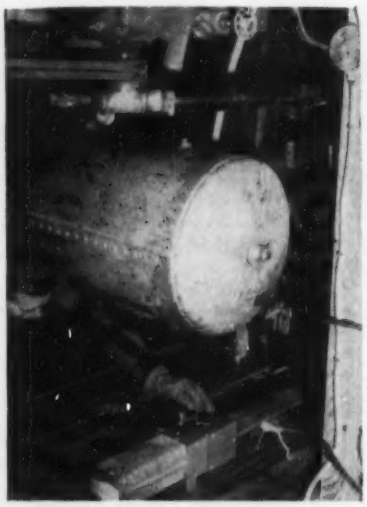
Pump House Heater Avoids Frozen Pipes

RICH BAKES, Farm Representative, Washington Water Power Co, Pullman, Washington

Elimination of frozen water tanks and pipes is assured with the installation of a pump house heater on the Joe Parker farm, Moscow, Idaho. The heater provides a large heating surface without the hazard of glowing wires.

The heater consists of a thermostatically controlled 500-w heating element in a cast-aluminum grid. It is designed to withstand the conditions of dirt and dampness usually found in a pump house.

The unit operates at a relatively low temperature and minimizes the danger of fire. Supply voltage may be 120 v or 240 v as required.

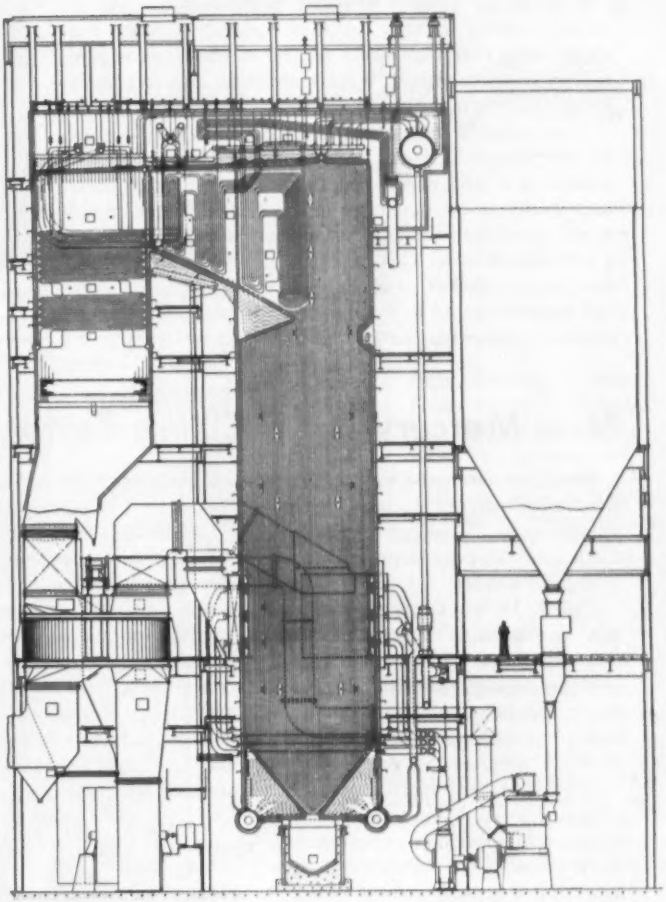


HEATER CONTROL KNOB adjusts thermostat of 500-w unit to desired temperature.

JOHN SEVIER STEAM PLANT

Tennessee Valley Authority

C-E controlled circulation boilers



The C-E Unit shown above is one of three duplicates now being fabricated for the John Sevier Steam Plant of the Tennessee Valley Authority at Rogersville, Tennessee.

Each of these units is designed to serve a 200,000-kw turbine-generator operating at a throttle pressure of 1800 psi with a primary steam temperature of 1053 F, reheated to 1053 F.

They are of the controlled-circulation, radiant type with a separated furnace arrangement. Secondary superheater surface is at the outlet of one furnace and reheater surface at the outlet of the other. Primary superheater sections and economizer surface follow both the secondary superheater and reheater surfaces. Regenerative air heaters follow the economizer surfaces. The section shown above is taken through the superheater furnace.

Pulverized coal firing is employed, using bowl mills and tilting, tangential burners. Natural gas may be used as an alternate fuel.

C-E

COMBUSTION ENGINEERING, INC.

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

BOILERS; FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

Even Denver Promotes Air Conditioners

"It gets plenty hot in Denver in the daytime—which is when you need air conditioners anywhere." This was the philosophy behind an air conditioning campaign in Denver, the city claimed "air conditioned by the snowcapped Rockies." Joining with Public Service Co of Colorado in this first concerted enterprise to sell air conditioners were the Rocky Mountain Electrical League, Rocky Mountain Gas Association and local distributors.

Running for 17 days in June, the promotion's aim was to add volume through the slow summer months. Featured in the campaign was a contest in which participants told in 25 words or less "What year 'round air conditioning in my home would mean".

Nineteen different types of air conditioners were donated by distributors as prizes for the winners. Entry blanks, printed in a local paper, had to be endorsed by an appliance dealer to be acceptable in the contest. Other newspaper promotion included a special 16-page section in a Saturday edition. This consisted of advertisements from distributors, dealers, and Public Service, editorial copy and illustrations of air conditioners. Promotion follows a successful campaign last February on clothes dryers.

DENVER DEALERS step inside a plastic cell to test the effectiveness of a room air conditioner. This display of units was set up at a dealers' meeting prior to the 17-day, all out campaign during June

New Mercury Lamp Claims Better Color

Tests are now underway on a new fluorescent-mercury lamp which the manufacturer, Westinghouse Electric Corp, says is vastly improved in natural color quality.

Called "Deluxe Golden White", the new lamp color is expected to extend the application of mercury lighting into the commercial field. It should prove popular, says manufacturer, in banks, high-ceilinged offices and stores, churches, libraries and gyms.

The deluxe lamp uses the same inner phosphor coating as present color-corrected lamp models to complement the blue output of the mercury-vapor light. But a ceramic coating is baked on the outer bulb to filter out annoying green and yellow light.

While it is rated at 400 w like standard mercury-vapor models, the new lamp uses a larger bulb. For best results, fixtures such as those developed for the 1,000-w fluorescent-mercury lamp should be used. It operates with standard 400-w ballasts and has an average life of 6,000 hr.

Price and availability of the "Deluxe Golden White" lamp will be announced following field tests.

OUTER CERAMIC COATING produces improved natural color in new mercury lamp shown at left. Standard model is at right

Utilities Support Lamp Promotion Program

Results of a recent EEI survey made with member companies reveal an increasing support for the BEAUTY-plus Lamp Program, says Don Julien, Managing Director of the BEAUTY-plus Lamp Council, Cleveland.

"In the first poll taken earlier in the year," Mr. Julien stated, "62 utilities said they would stage BEAUTY-plus promotions in cooperation with retailers this fall. That number now has risen to 79, an increase of 17, and with some companies still to be heard from it is not unlikely that the final count will reach 90. These companies represent considerably more than half the residential meters in the country."

S & S Shorts

Public Service Wins

Public Service Electric & Gas Co is top award winner in 4th annual window display contest (electric light and power companies division) sponsored by NEMA's Electric Housewares Section. New Jersey utility's winning entry featured electric housewares as ideal gift choices for June brides. George W. Browne, company display supervisor, was creator.

TV-Viewers See Good Lighting

Television has been used to promote good lighting by Cincinnati Gas & Electric Co on a 15-min, 3-day a week show, "Lights On - Music." Commercials give visual proof of how lighting gives new life to drab room. Show features local music students who compete for $500 scholarships. Off air for summer, show's viewer response has been so great that it may be resumed this fall.

New Products:

A second complete and separate cycle designed specifically for fine synthetic fabrics (dacron, nylon, etc) is feature of new automatic washer introduced by Kelvinator. No. 2 cycle provides shorter washing time, gentler handling required by man-made fibers.

Look INTO THE POLE STAR

AND SEE WHY IT IS FAST BECOMING A *Best Seller*

Sealed Tank Construction Throughout

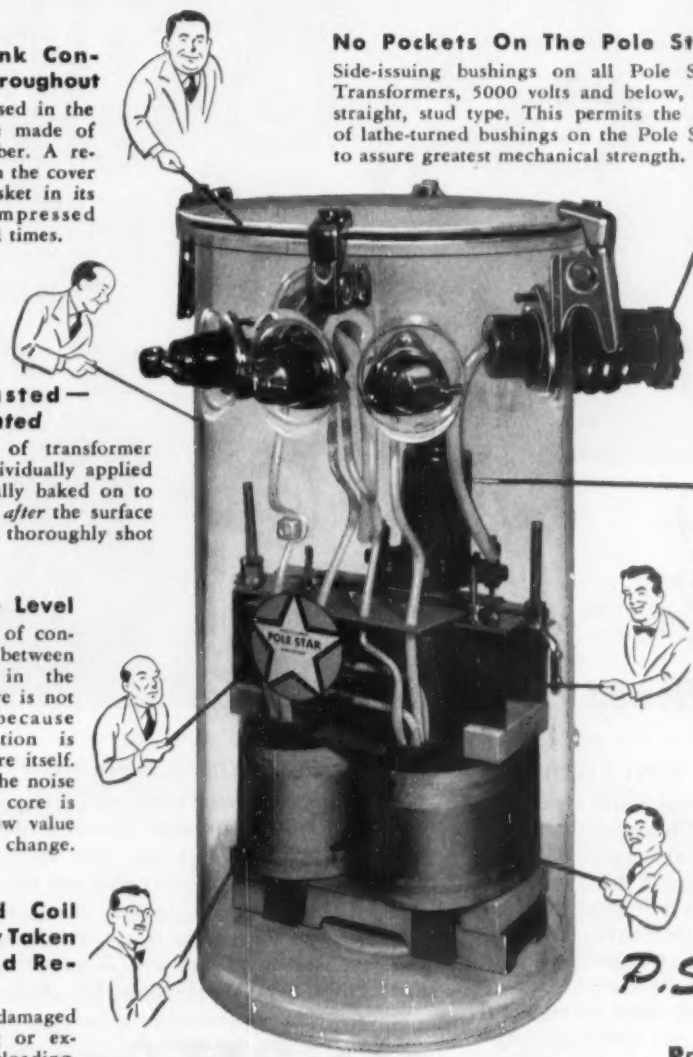
All gaskets used in the Pole Star are made of synthetic rubber. A retaining ring in the cover keeps the gasket in its properly compressed position at all times.

No Pockets On The Pole Star

Side-issuing bushings on all Pole Star Transformers, 5000 volts and below, are straight, stud type. This permits the use of lathe-turned bushings on the Pole Star to assure greatest mechanical strength.

Tap Changes Made From Above Oil Level

The tap changer handle is above the oil level, where tap changes can be made with great ease by turning the handle to the proper tap position. White letters on black bakelite clearly show the tap positions.



Shot Blasted— *Then Painted*

Three coats of transformer paint are individually applied and individually baked on to the tank *only after* the surface of the tank is thoroughly shot blasted.

Low Exciting Current

Laminations in the Pole Star core are individually lapped. The large cross section at the lap reduces the density and prevents a concentration of flux. As a result, the reluctance of the magnetic circuit is low. Each lamination forms its own magnetic path undisturbed by butt joints and points of high density.

Low Noise Level

The amount of contact pressure between laminations in the Pole Star core is not important because each lamination is actually a core itself. As a result, the noise level in the core is fixed at a low value and will not change.

Coils Wound Independently of The Core

Separate winding allows each coil to be tightly wound and individually treated to give it great mechanical strength.

Core and Coil Units Easily Taken Apart and Rebuilt

If a coil is damaged by lightning or excessive overloading, cores can be taken apart and rebuilt with replacement coils. This can be accomplished without appreciably affecting the low core loss or exciting current of the Pole Star.

P.S. Let the POLE STAR be your guide . . .

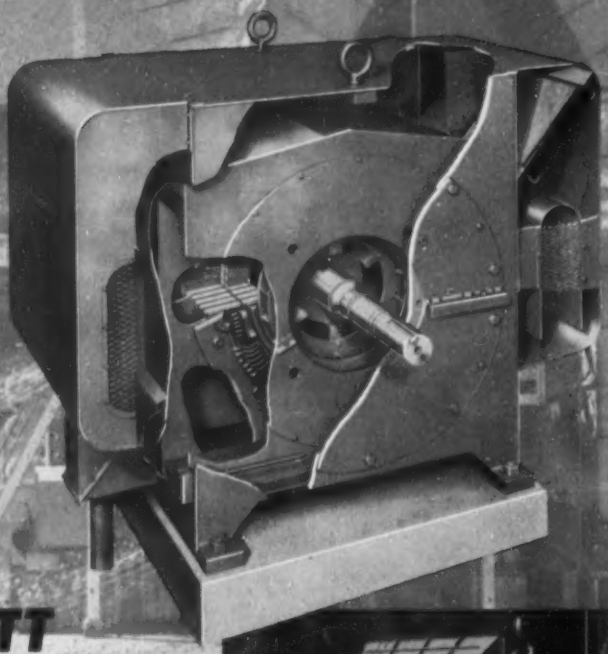
Product Of Long Experience
Safe Thrifty And Reliable

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PENNSYLVANIA • *Greater Pittsburgh District*

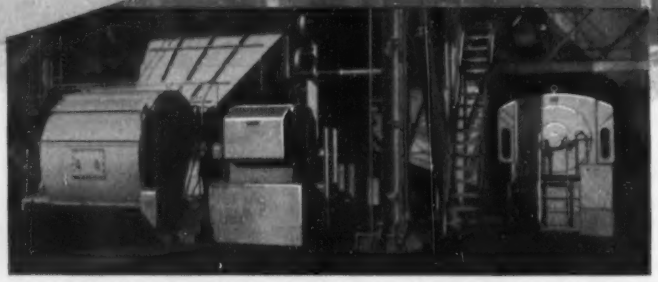
100-mph dust-storm runs an elimination test on outdoor motors



Elliott FABRI-STEEL MOTORS AND GENERATORS

At left: Cut-away view of the most thoroughly protected and ventilated motor yet built for outdoor service, which in hundreds of installations is daily proving its superior protection against rain, snow, dust or any adverse weather condition.

Below: The I-d and I-s fan motors at the western utility at which the two dust storms did their worst.



Only ELLIOTT outdoor-splashproof (weather-protected) motors were left in operation and unaffected

DRIVING MANY TONS OF DUST BEFORE IT, the storm roared down the mountains and across five miles of drought-stricken plain. The air lines rated the condition "visibility zero-zero"— as bad as it could get. At a big western utility, right in the storm center, a number of modern outdoor motors of three different makes were up against the test of their lives — and two of the three makes failed the test, plugged with dust in bearings and windings. Only the Elliott outdoor-splashproof motors at the station came through the storm unaffected — bearing oil and stator windings as clean as if no storm had occurred.

AS THOUGH TO DOUBLE-CHECK THESE FINDINGS, two weeks later a similar storm struck the plant. Again the Elliott motors, although located in the most exposed position, were the only ones unaffected by a condition about as tough as nature can impose.

The term "weather-protected" in connection with Elliott Motors, means what it says. Your nearby Elliott sales engineer can tell you why, or write for the bulletin to Elliott Company, Ridgway Div., Ridgway, Pa.

ELLIOTT Company

R4-15

TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS

N. H. CALLARD

EARL D. OSTRANDER

BPA Names 2 New Directors

N. H. Callard will have charge of operation and maintenance and Earl D. Ostrander administrative management

Reorganization of the top staff of Bonneville Power Administration to conform with recommendations of a management survey team has been completed with appointment of N. H. Callard of San Francisco as director of operation and maintenance and Earl D. Ostrander, BPA controller since 1945, to the post of director of administrative management.

In announcing the appointments, BPA Administrator William A. Pearl noted the survey team which reviewed the agency's operations for Interior Secretary Douglas McKay had recommended consolidation of all activities within three major divisions. Top engineering post was assigned June 30 to Eugene C. Starr, former Oregon State College professor, who became BPA chief engineer.

Directors' Duties . . . Callard's assignment carries the responsibility for all power operations, maintenance, plant services, area offices, power contracts, and customer servicing. Ostrander will head budget and management, finance and accounting, personnel, supply, and administrative services.

A native of Portland, Ore., Callard attended the University of Washington. He has had diverse commercial, engineering, and managerial experience with Westinghouse Electric Corp, having served as Pacific Coast utility manager between 1928 and 1939.

During World War II Callard was loaned for two years to the U. S. Navy Bureau of Ships. In 1943 he was assigned to India as a deputy general representative for the State Department in the Office of War Information. After the war he returned to Westinghouse. He remained there a short time prior to becoming manager of Hilo Electric Co in Hawaii in 1947.

Worked with Illinois Commission . . . Ostrander was employed with Illinois Commerce Commission for eight years prior to joining BPA in 1941. Previously he was associated with Emery Peck Rockwood, investment bankers, and James O. McKinsey & Co, accountants-engineers, both of Chicago, and Investment Research Corp of America, Detroit, Mich.

Ostrander, a native of Wellington, Kan., received his B.S. degree from Kansas State Teachers College and a master's degree in finance from University of Chicago.

Work Slated on Gary Plant

Northern Indiana Public Service Co plans to start work this fall on a $20-million power plant at Gary, Ind. First generating unit to be installed will have a capacity of 137,500 kw.

POWER BRIEFS

● Plans to build a $10-million Northwestern Division headquarters on a 10-acre site near Traverse City, Mich., have been announced by Consumers Power Co. The utility had planned to erect the structure two years ago, but Traverse City sought to prevent expansion of the company's distribution lines within city limits. A Michigan state supreme court ruling against the city cleared the company's way to go ahead with the expansion.

● Florida Power & Light Co will start construction soon of an 88,000-kw generator at its Palatka plant. The new unit is scheduled to go into operation in the fall of 1956. At its Cutler plant, also in southern Florida, the company will put an 80,000-kw unit on the line this fall.

● Preliminary work will be started this month by Southwestern Gas & Electric Co on the installation of a 75,000-kw generating unit at its Knox Lee plant in Gregg County, Tex. The new unit, reported to be the largest purchased by the utility, is slated for operation in April, 1956. The Knox Lee plant currently houses three 35,000-kw units.

● Commonwealth Edison Co's Ridgeland Station has been completed now that its fourth generating unit has been put in commercial operation. With the addition of the 150,000-kw turbine generator the nameplate capacity of the station is 600,000 kw.

● New Hampshire Gov Hugh R. Gregg and Council have approved a resolution designating the State Public Utilities Commission as the state's bargaining agency in dealing with New York State in acquiring surplus power that will be generated on the St. Lawrence River. Resolution calls for the PUC, on a nonprofit basis, to arrange for distribution of such power to private companies in New Hampshire.

● A large capacity network analyzer built by General Electric Co, has been installed at Syracuse University's College of Engineering through the cooperation of Niagara Mohawk Power Corp, New York State Electric & Gas Corp, and GE. These companies are scheduled to use the machine for 39 weeks of the year. The instrument, 66 ft long and 7 ft high, was designed for use in studying power transmission and distribution system problems.

Employee's work is improved through . . .

A Training Course on Transformers

W. T. COGBILL, Jr., Virginia Electric & Power Co, Richmond, Va.

More than 663 Virginia Electric & Power Co employees have completed the Westinghouse Electric Corp transformer training course in their off-duty hours since the first class was organized in September, 1951.

Although the majority of those enrolled in the course have been from Line and Service Departments, nearly every department in the company has been represented. Among those successfully completing the course have been two women from the Plant Records Department whose daily work requires keeping transformer records.

A 12-Hour Course . . . The transformer training course requires a total of 12 hours divided into two-hour periods.

To teach the course, Vepco has used qualified employees and high school and college science instructors. P. W. Smith, director of the Vepco employee information program, feels that the employee instructors are better able to speak the language of utility workers.

At the end of the course, each employee is given a questionnaire to fill out and send in with no signatures required. They are asked how much they have learned during the classes, have they learned anything that would benefit them in their daily work, and what comments they might have on the course as a whole, plus suggestions for improving it.

Response to the questionnaires has been excellent. About 95% of those completing the course feel that they have learned a great deal about transformers and that their increased knowledge will help them on the job.

Answers and Comments . . . Some of the answers and comments were:

- The course holds the interest of employees, particularly through extensive use of models and props as visual aids.
- Linemen are given a better insight into the customary delta and wye connections of pole type transformer banks.
- Transformer repair shop personnel gain an appreciation of the necessity for quality work in repair jobs.

Interviews with foremen bear out these conclusions: Said one, "Our employees have suddenly become transformer conscious. Men who had never hooked up a transformer are now capable of making delta and wye connections, and everyone in the line crew reads the name plate data."

Another line foreman said, "Even the grunts and truck drivers who took the course are taking more interest in transformer connections being made up the pole. Several groundmen have corrected mistakes about to be made up the pole on hook-ups."

Vepco plans to continue the classes as long as there is a demand.

Wagner®
TRANSFORMERS
... the choice of leaders in industry

CHOOSE WAGNER UNIT SUBSTATION TRANSFORMERS

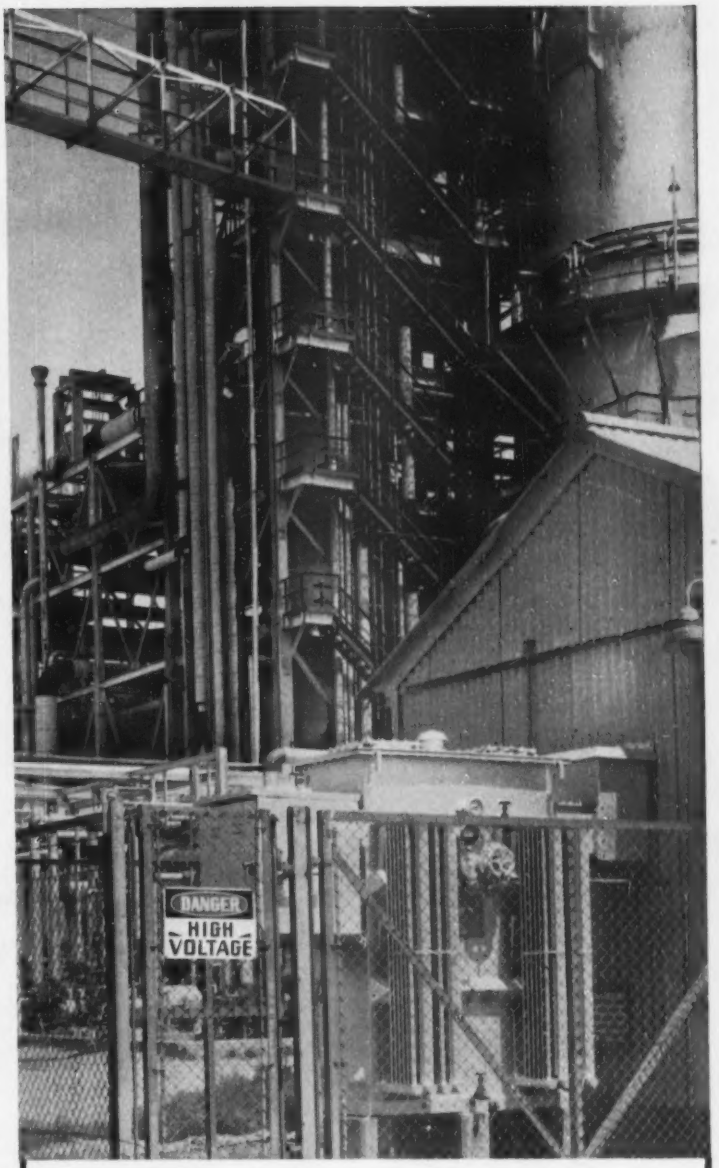
for always dependable power...

Here's dependability at work! This Wagner liquid-filled unit Substation Transformer feeds the catalytic unit at The Carter Oil Company refinery in Billings, Montana.

You'll find hundreds of Wagner Transformers, furnishing *always dependable* power, in spots where failure would incur great cost, because Wagner Transformers are known for their unfailing dependability—a reputation backed by more than sixty years of transformer building experience.

Wagner Unit Substation Transformers, both liquid-filled and dry-type, are carefully designed to meet distribution requirements. Both liquid-filled and dry-type unit substation transformers are built in ratings through 2000 kva, 15 kv and below—you can choose the type and rating that exactly meets your load-center distribution requirements.

Bulletins TU-13 and TU-56 give full information. Your nearby Wagner engineer can help you solve your load-center problems. Call the nearest of our 32 branch offices, or write us.



This 750 kva, 2400/4160Y to 480 volt, 60 cycle, three-phase, liquid-filled Wagner Unit Substation Transformer feeds the catalytic unit at The Carter Oil Company, Billings, Montana refinery. It is throat connected to switchgear in the adjoining building. Purchased and installed by The Fluor Corporation, Ltd., Engineers and Constructors for the Petroleum, Chemical and Power Industries, Los Angeles.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6456 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

T54-3

TO THE PERPLEXED BUYER WHO WANTS TO

Judge Potential Usefulness of an Insulator

Isn't this the core of any valid comparison between suspension insulators:

The thing that determines your best insulator investment — at competitive prices — is length of service under your service conditions.

Thus, to invest wisely, it would seem that the buyer should have some precise means of determining future performance. Nothing of the like exists, sadly, and no manufacturer can guarantee performance over extended periods of time.

However, there is a method for evaluating potential usefulness of a given lot of insulators.

Manufacturers competing for your business submit quality control data from statistical sampling. From the data for each lot, you can determine if that lot has similar, better, or worse characteristics than previous production from that manufacturer. If control data shows current production corresponds to past, and if past output has given good service, you may infer the insulators you buy now will serve equally well. If data indicates current production corresponds to past, and past output has performed badly in use, you may infer that the insulators under consideration will also give trouble.

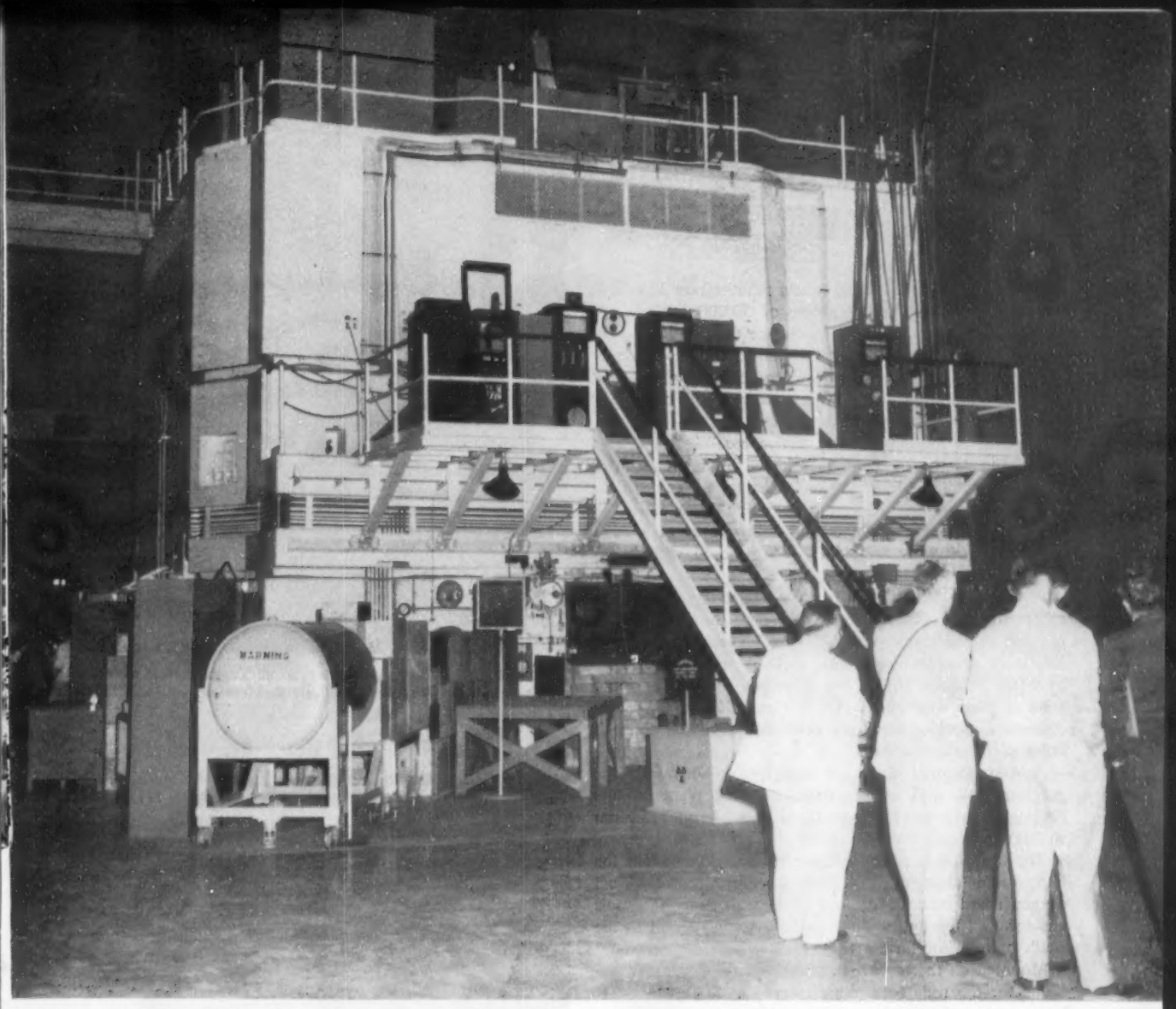
This seems to be a good place to point out that O-B Suspension Insulators made in 1919 are still in service. We're confident that younger O-B units will match that record just as soon as time permits!

Ohio Brass

MANSFIELD OHIO, U.S.A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4440-H



MATERIAL TESTING REACTOR, approximating a 32-ft cube, is a basic experimental tool. Some components of future reactors are tested here

ARCO, IDAHO, EXPERIMENTAL REACTOR UNVEILED

AEC invites press for first viewing of atomic unit which has greatest neutron flux

Security wraps were removed recently from the Arco, Idaho, materials testing reactor (MTR) which produces a greater neutron flux than any other in existence. Press and radio saw the test station which is on the 686-sq-mi tract with the experimental breeder reactor which produced the first usable electric power from nuclear energy in December 1951.

Prime purpose of the MTR is to test the effects of intense neutron and gamma radiations on materials and fuel elements for future reactors of high fluxes and specific powers. Materials for reactors are tested under simulated operating temperatures and pressures and with different coolants to determine their practicability as reflectors, moderators, and shields. Structural materials are tested for the effect on their properties of intense gamma radiations. The MTR is used also in fundamental experiments in nuclear physics.

Continued from preceding page

TEST MATERIALS, FUEL ELEMENTS IN NEUTRON, GAMMA RADIATIONS

The MTR became critical (chain reacting) on March 1, 1952, attained full design power of 30,000 kw of heat May 22, 1952, and has operated since then without shutdowns except those regularly scheduled in the operating program. It is a thermal (slow) neutron reactor using enriched uranium as fuel, ordinary water as both moderator and coolant, and beryllium as reflector.

The fuel is contained in an "active core" inside a 16 x 28 x 24-in. "lattice" region, surrounded by a 3-ft reflector of beryllium pieces. Lattice and reflector are enclosed in a 55-in. diameter aluminum tank which is extended by stainless steel sections above and below to form a 30-ft well. The well's top and bottom are closed with heavy lead-filled steel plugs.

A two-zone secondary graphite reflector outside the reactor tank provides additional space having thermal neutron fluxes above 10^{13}n/cm^2/sec. The outer zone, a 3-ft thick graphite-block wall, encloses some 7-ft-square-by-9-ft-high space around the aluminum tank. The inner zone is filled with about 700,000 graphite balls 1-in. in diameter. Cooling air flows over the balls and through holes in the graphite wall.

A 4-in. thermal shield of steel plates surrounds the graphite wall, and a 4-in. space between plates admits cooling air. Around the thermal shield is a barytes (barium sulfate) aggregate concrete shield about 9-ft thick.

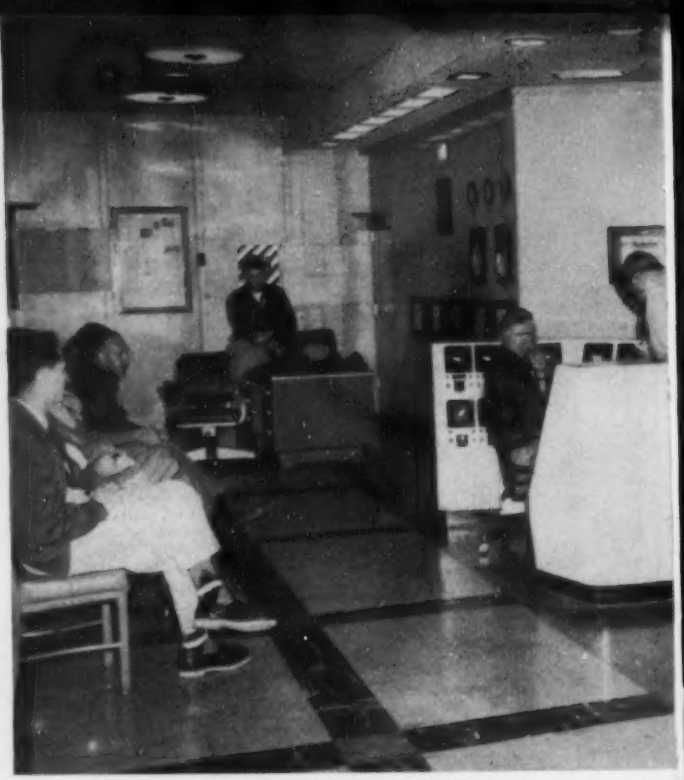
The top plug is removable for replenishing fuel in the lattice and changing beryllium in the reflector. Fuel elements and other pieces are lifted with grappling tools and lowered through a chute and valve mechanism in the well's bottom into an 18-ft deep water canal.

Mounted on the top plug are electrically driven mechanisms for the rods controlling rate of fission. The MTR has a fuel section in the control rods below the cadmium section so that fuel is pulled into the lattice section as the cadmium is removed. This feature prolongs the reactor's functioning between shutdowns. In an emergency all control rods drop by gravity to bring the cadmium sections into the active lattice.

Lattice and reflector are cooled by water flowing at 20,000 gpm which enters near the welltop at 100 F and leaves near the bottom at 111 F. It feeds by gravity from a 170-ft high storage tank through the reactor to a vacuum spray evaporator system for cooling and degassing and is pumped back to the storage tank. Cooling water is highly purified to minimize possible radioactivity induced as it cools the reactor.

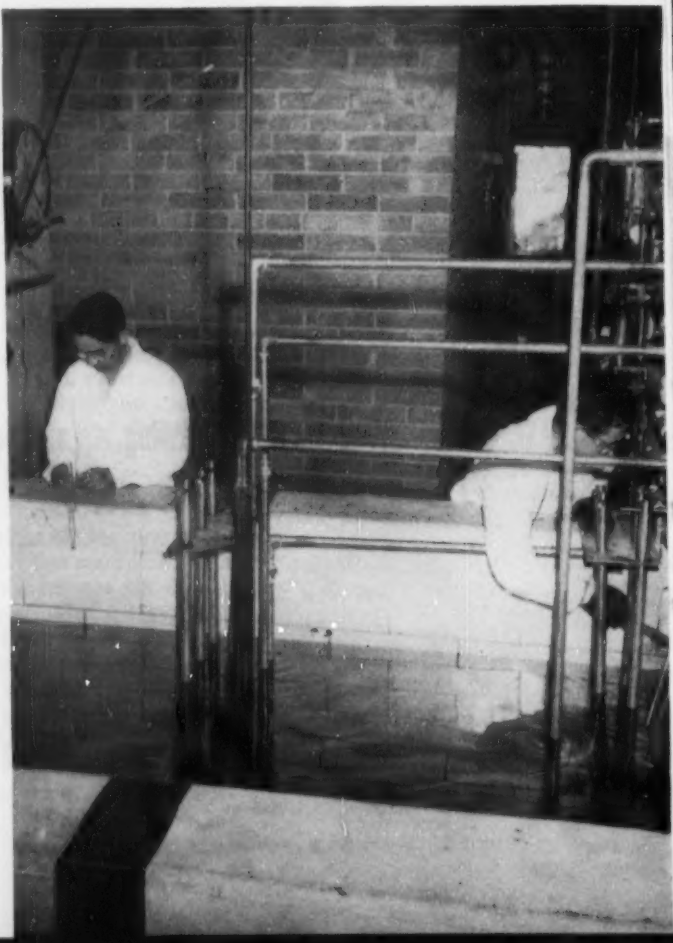
Graphite reflector and steel thermal shield generate the equivalent of 500 kw of heat by absorption of neutrons and gamma rays and are cooled by air flowing at 25,000 cfm. Blowers in the fan house draw air from the reactor building into the reactor and discharge it to the atmosphere through a 250-ft stack.

The MTR's experimental facilities include a crystal and a time-of-flight spectrometer, using a neutron beam from outside the reactor to study irridations upon materials.

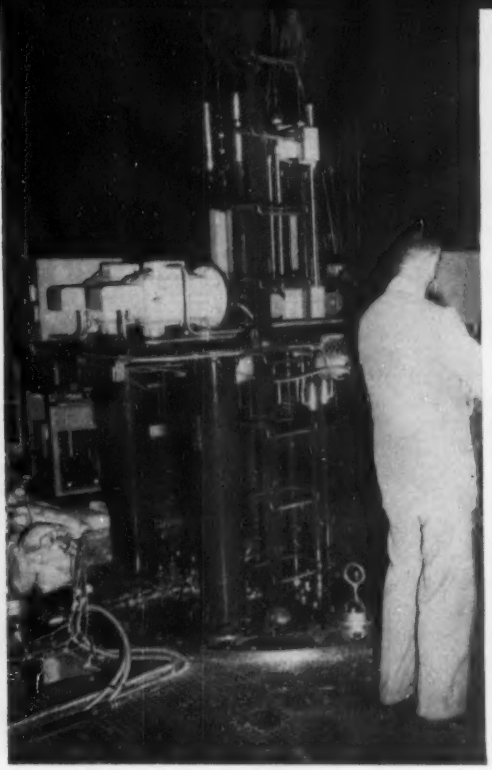


REACTOR CONTROL ROOM contains operator's console, focus of controls and indicating instruments. Latter in triplicate show nuclear activity in MTR. Some 30

WATER CANAL introduces materials into reactor. The valves and handles control the hydraulic shuttle tubes carrying materials to reactor



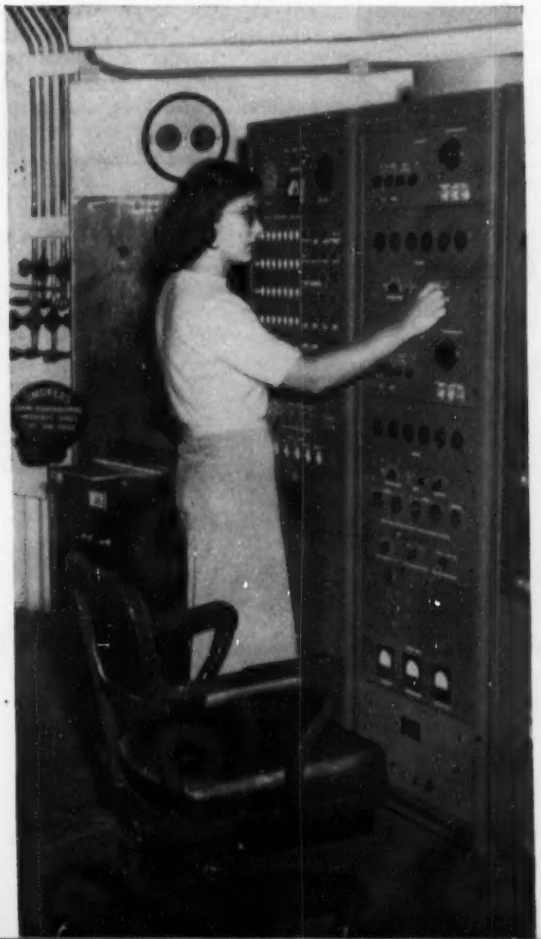
AEC laboratories or contractors are using the material testing reactor



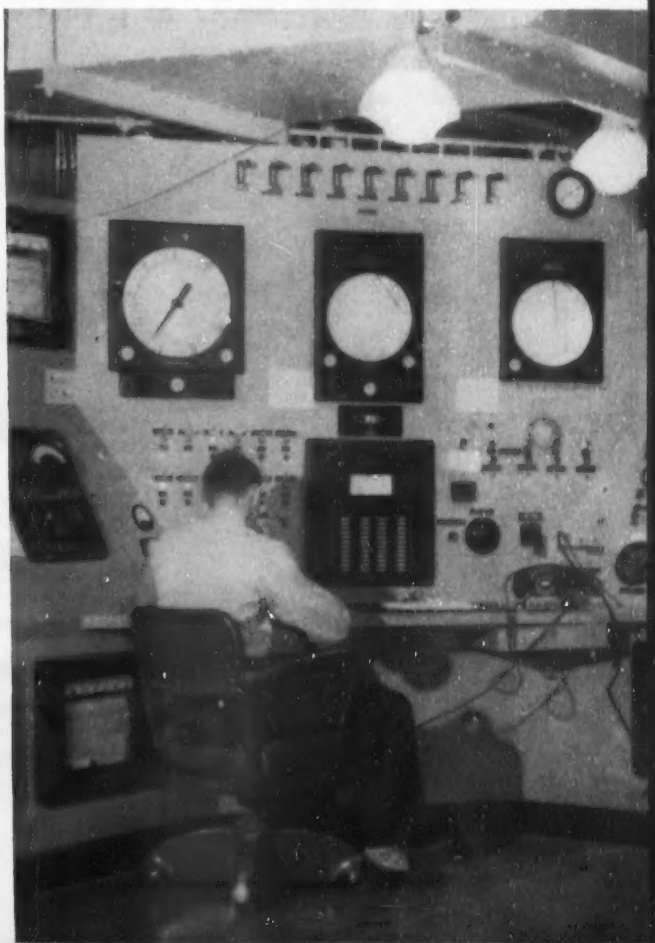
RATE OF FISSION is controlled by the electrically operated cadmium rods. They are located on top of reactor

HOT CELL is used to test solid radioactive material. Special 4-ft thick glass is used

CRYSTAL SPECTROMETER is controlled through instrument bank on right. Electric typewriter behind operator records test data



COMPLICATED EXPERIMENTS involving temperatures and neutron fluxes at the reactor's center require this large array of instruments



SAVE

$64.25 PER 1000 FEET

with Kaiser Aluminum Triplex

As YOU SEE in the box below, when you switch from three open wire copper services to Kaiser Aluminum Triplex you save up to $64.25 per 1000 feet – based on reports from 10 utilities.*

You can be sure of getting the *maximum* savings from Kaiser Aluminum Triplex by taking full advantage of Kaiser Aluminum service. Experienced Kaiser Aluminum field engineers work with your crews right in the field where desired, demonstrate ways to speed installations and cut costs.

ACT NOW – as hundreds of power companies are doing! Convert to Kaiser Aluminum conductor easily, efficiently, economically – and save thousands of dollars a year. Contact any Kaiser Aluminum sales office listed in your telephone directory, or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. General Sales Office, Palmolive Bldg., Chicago 11, Ill.; Executive Office, Kaiser Bldg., Oakland 12, Calif.

Kaiser Aluminum

The nation's largest producer of triplex and aluminum weatherproof conductor

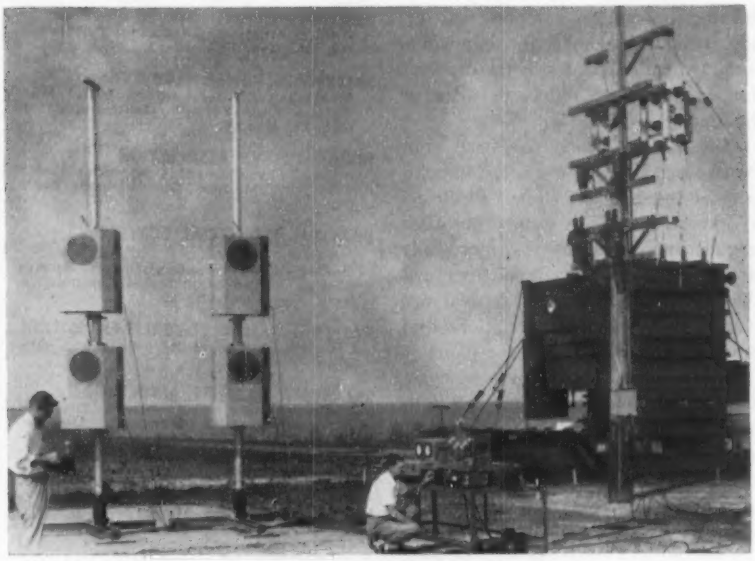
Here is a typical example of the big savings possible with Kaiser Aluminum Triplex

INSTALLED COSTS FOR 10 SERVICE DROPS (Average Length of 100 ft.)

	#6 Solid TBWP Copper	#4 Kaiser Aluminum Triplex (Oyster)
Cost of conductor	$135.15	$103.00
Cost of pole taps, entrance connectors, house wireholders	15.30	14.70
Total materials cost	$150.45	$117.70
Total labor cost	80.80*	49.30*
TOTAL COST	$231.25	$167.00

TOTAL SAVING – $64.25 – PER 1000 FT.!

*Average labor costs based on reports from 10 utilities in various sections of the country that have switched from three open wire type service to Kaiser Aluminum Triplex.



ENGINEERS at Carrollville laboratory take sound readings during survey in which recorded sound level of transformer is being superimposed on recorded ambient at proposed location

AC Offers Acoustical Service

Company opens outdoor transformer noise laboratory at Carrollville, Wis.; offers low-cost acoustical survey service

An outdoor laboratory for the study of transformer noise has been completed by Allis-Chalmers Manufacturing Co. The new facilities are at Carrollville, 14 miles south of Milwaukee, overlooking Lake Michigan.

The Carrollville laboratory makes it possible for the company to offer at a nominal cost acoustical surveys of transformers.

G. W. Clothier, manager, transformer section, said, "Throughout industry and in our own laboratories there are a number of promising long-range studies in noise reduction under way. However, we're trying to furnish a service for the engineer who has a problem today. To do this the most sensible approach seems to be that of analyzing transformer noise from the standpoint of the environment in which the transformer will be installed."

Every neighborhood has its own individual ambient noise characteristic. Power company engineers often have to determine whether the noise from a planned transformer superimposed on the background noise will be objectionable.

In a typical acoustical survey a careful study is made of the ambient noise, including the effects of topography, subterranean rock formations, and day-night and other variations. The study includes both measurements and recordings over the entire noise spectrum. This is done by a crew using a full complement of specially designed equipment. Where further study of the problem is advisable, these measurements form the basis for reproducing an accurate replica of the ambient noise.

Because of the unusually low ambient noise level at the Carrollville laboratory, a number of variations in the survey are possible. For instance, an acoustical contour analysis of a transformer can be made at several hundred yards in all directions. Ambient noise levels at any site can be reproduced at any decibel level desired. The effects of various types of sound absorbing walls under natural outdoor conditions can be measured and demonstrated. Facilities to energize any rating of transformer under accurately controlled conditions are available.

Busway Al-Alloy . . .

. . . Developed by Alcoa has 25,000 psi yield strength, 57% IACS conductivity

A new aluminum alloy for conducting electricity has been developed by Aluminum Company of America. Designated 2EC-T8, it fills the need for a bus way and isolated phase conductor alloy having considerably higher yield strength and better creep characteristics than can be obtained with EC metal. High yield strength is particularly important to resist deformation when closely grouped bus bars are subjected to high short-circuit forces.

The table shows the properties of the new alloy. Conductivity approaches that of EC, while strength approaches that of 63S-T6.

Alloy and Temper:	2EC-T8	EC-H17
Conductivity at 20 C, IACS min:	57%	61%
Tensile Strength, psi min:	28,000	17,000
Yield Strength, psi min:	25,000	15,000

Standard manufacturing tolerances for the new alloy in rectangular bus bar are the same as for EC-H13. Tolerances for tubular bus are the same as for drawn tubes.

Experimental work is being continued by Alcoa with 2EC alloy to allow establishment of other standard tempers with different characteristics. For example, 2EC-T6 having conductivity of 55% and a tensile yield strength of 25,000 might be desirable for some applications.

Pallet Standards Revised Upwards

National Wooden Pallet Manufacturers Association announces two developments of interest to pallet users. First, the new Revised Minimum Standard Specifications for Warehouse, Permanent, or Returnable Pallets shows a general up-grading of the minimums and several major departures from the original 1949 NWPMA standards. The second development involves the adoption of an association brand which is tied into the revised standards.

The standards for the first time

establish two industry grades of pallets, set up a numerical system for pallet type designation, and place new limitations on fastenings, lumber requirements, and manufacturing practices. They are intended for use as a base minimum for purchasers. Copies of the specifications are available from the National Wood Pallet Manufacturers Association, Barr Bldg, Washington 6, D.C.

When the association brand appears on wooden pallets, it assures the purchaser that the product is of specified grade and not less than the minimums in quality. The brand also identifies the mill in which the pallet was produced.

Kennecott Settles Strike At Domestic Mines

The 16-day strike at Kennecott Copper Corp's four domestic mines ended Sept. 1. Copper loss caused by the strike is estimated at 24,000 ton. The company said the settlement included a 5¢ hourly wage boost and about 2.7¢ an hour in fringe benefits.

Consolidated Coppermines Corp adjoining Kennecott's Nevada property also resumed production.

Several Chilean mines remained closed. The government was reported readying a decree returning workers to their jobs if the strike is not settled.

Last week Anaconda Copper Mining Co's Montana mines and plants remained closed. Also closed were Miami Copper Co mines in Arizona, and Inspiration Consolidated Copper Co.

Copper supplies are expected to remain tight for several months and maintain a firm price at 30¢ a pound.

Square D Opens Detroit Plant Closed by Strike

Square D opened the gates of its Detroit plant Sept. 2 for any workers wanting to return to work. L. W. Mercer, executive vice president, says that the back-to-work movement has been successful and that the plant should be in full production inside of a week. Had the movement not worked, Square D had planned to close down the 500,000-sq ft plant and relocate.

The company has a Circuit Court injunction limiting picketing. Also, anyone involved in picket-line violence can be held in contempt of court.

To supplement those employees returning to work, the company was hiring men and women for immediate employment. Sept. 8 was the deadline for employees to return to work or be fired.

The Detroit plant has been shut down since June 15 when 1,200 members of Independent United Electrical Workers of America walked out after negotiations for a new contract broke down. Sporadic talks failed to break the deadlock. On Aug. 27 federal mediators discontinued negotiations and Square D acted to reopen the plant.

The strike has cost employees about $1.3 million in wages and about $200,000 in fringe benefits. More than half a million man-hours of production have been lost. Square D's cancellation of purchases from suppliers totals about $1.5 million.

MANUFACTURING BRIEFS

Ozalid, a division of General Aniline & Film Corp, Johnson City, N. Y., will have in production this autumn a Model 800 whiteprint machine. This new model will reproduce translucent drawings and business forms up to 42-in. wide at speeds 8 to 30 fpm by electronic drive.

Sacramento MUD has awarded a contract to Bethlehem Pacific Coast Steel Corp of San Francisco for some 106 steel transmission towers to be used in linking SMUD with the Central Valley Project system. The corporation bid $199,034 for delivery next spring.

MEETINGS CALENDAR

(*Continued from page* 43)

General Meeting, Hotel Statler, New York, Jan. 31-Feb. 4, 1955.

INSTITUTE OF RADIO ENGINEERS
Professional Group on Industrial Electronics and Pittsburgh Section of IRE, Symposium, Mellon Institute, Pittsburgh, Pa., Sept. 29-30.

INTERNATIONAL ASSOCIATION OF ELECTRICAL LEAGUES
19th Annual Conference, Bellevue-Stratford Hotel, Philadelphia, Sept. 29-Oct. 2.

NATIONAL ELECTRONICS CONFERENCE
10th Annual Conference, Hotel Sherman, Chicago, Oct. 4-6.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS
Pacific Zone Convention, Mark Hopkins Hotel, San Francisco, Oct. 4-7.

INDIANA ELECTRIC ASSOCIATION
Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 6-8.

CONTROLLERS INSTITUTE OF AMERICA
Annual Meeting, Edgewater Beach Hotel, Chicago, Oct. 10-13.

INTERSTATE POWER CLUB
Meetings will be held at Hotel Martinique, New York, on following dates: Oct. 11, Dec. 6.

IOWA UTILITIES ASSOCIATION
Annual Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 11-12.

NATIONAL INDUSTRIAL CONFERENCE BOARD
Third Annual Conference on Atomic Energy in Industry, Hotel Commodore, New York, Oct. 13-15.

NATIONAL SAFETY CONGRESS-EXPOSITION
Conrad Hilton Hotel, Chicago, Oct. 18-22.

OKLAHOMA UTILITIES ASSOCIATION
Electric Light and Power Division, Western District Meetings, Duncan, Okla., Oct. 21; Eastern District Meeting, Ada, Okla., Oct. 22; Annual Convention, Mayo Hotel, Tulsa, Okla., March 24-25, 1955.

AMERICAN WELDING SOCIETY
National Fall Meeting, Sherman Hotel, Chicago, Nov. 1-5.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Annual Meeting, Haddon Hall Hotel, Atlantic City, Nov. 8-11; Winter Meeting, March 7-11, 1955.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS
Annual Convention, La Salle Hotel, Chicago, Nov. 8-12.

AMERICAN STANDARDS ASSOCIATION
36th Annual Meeting and 5th National Conference on Standards, Hotel Roosevelt, New York, Nov. 15-17.

WISCONSIN UTILITIES ASSOCIATION
Electric-Gas Sales and Engineering Convention, Schroeder Hotel, Milwaukee, Nov. 17-19.

NATIONAL FARM ELECTRIFICATION CONFERENCE
1954 Meeting, Van Curler Hotel, Schenectady, N. Y., Nov. 18-19.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual Meeting, Statler Hotel, New York, Nov. 28-Dec. 3.

21ST NATIONAL POWER SHOW
Sponsored by American Society of Mechanical Engineers, Commercial Museum, Philadelphia, Dec. 2-7.

EASTERN JOINT COMPUTER CONFERENCE-EXPOSITION
Sponsored jointly by American Institute of Electrical Engineers, Institute of Radio Engineers, and Association for Computing Machinery; Bellevue-Stratford Hotel, Philadelphia, Dec. 8-10.

ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION
Annual Meeting, Breakers, Palm Beach, Fla., Jan. 10-12, 1955.

NATIONAL ASSOCIATION OF PURCHASING AGENTS
24th Annual Mid-Winter Conference, Public Utility Buyers' Group, Shamrock Hotel, Houston, Tex., Feb. 13-15, 1955.

SOUTHERN SAFETY CONFERENCE-EXPOSITION
Jung Hotel, New Orleans, La., Feb. 27-March 1, 1955.

AMERICAN POWER CONFERENCE
17th Annual Meeting, Sherman Hotel, Chicago, March 30-31, April 1, 1955.

*Additions this week.

One-stop "shopping"

for your instrumentation needs!

WHATEVER your measurement and control problem . . . simple or complex . . . large or small . . . you'll find exactly the instrumentation you need in Honeywell's extensive, varied line of products.

What variables do you need to measure? This family of instruments covers temperatures, pressures, flow, frequency, power and practically everything that anyone would want to know about to supervise a process.

What accuracy do you require? Honeywell offers you a full selection, ranging from high-precision *ElectroniK* instruments to relatively simple protective devices.

Need control? You can choose from a line that extends from self-contained valve controllers small enough to hold in your hand, to complex graphic panels that regulate a complete manufacturing plant.

Instrumentation by Honeywell means a single responsibility for your complete control equipment . . . coordinated engineering, production and delivery. It gives you the important plus values of simplifying the training of your instrument maintenance men, and of minimizing your maintenance parts stock problems. And because this line is so complete, the instrumentation recommended for your application is selected without bias . . . needs no stretching or squeezing . . . represents the best combination of performance and economy for its intended job.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

• REFERENCE DATA: FOR A QUICK LOOK AT THE COMPLETE HONEYWELL LINE, WRITE FOR COMPOSITE CATALOG NO. 5001

FINANCIAL

Potential Dividend Increases . . .

. . . will be greater with the suburban-type utilities than companies serving cities, Lionel D. Edie & Co study shows

Suburban-type electric utilities have a greater potential for dividend increases than companies serving cities.

This potential, according to a report on a study by Lionel D. Edie & Co, results from two factors: "First, the current low payout which allows room for expansion; and second, continued financing needs as a result of capital expenditure requirements."

The study was made of privately owned electric utilities representing 38% of the kilowatthour sales of the industry. Companies chosen were representative of the industry at large and also those serving suburban areas, cities, and combined.

Suburban Trend . . . Edie's report on the study said: "In general those companies primarily serving in the suburban areas have paid out a smaller share of earnings in the form of dividends. To a great extent the high level of capital expenditures has been the reason. The continued trend to the suburbs (i.e. population) indicates a continued high level of capital expenditures.

"As opposed to this, companies primarily serving city areas have paid out a higher share of earnings in the form of dividends. In general capital expenditure needs of these companies have not been as great . . . and are expected to be lower."

The report shows that four representative suburban companies paid out an average of 66% of earnings as dividends and had an average annual population raise of 8%. Four representative companies serving cities, however, paid out an average of 79% of earnings as dividends and had a population increase of 0.7%.

Capital Disbursements . . . Capital expenditures for suburban companies during 1955, according to the study, will be 12% greater than for 1954 and population will increase 9%. For the city companies capital expenditures during 1955 were estimated to be 4% less than during 1954 and population is expected to be up 1%.

The report points out that capital expenditure for suburban companies "indicates a continuing need for funds. Part of this financing has been done through retained earnings which include accelerated amortization, and part by external means. This creates a pressure on the suburban type companies to "be attractive to investors." One of the accepted techniques in meeting financing needs . . . has been "to raise dividends."

BPA Rates . . .

. . . may be raised from $17.50 to $20 or $21 a kilowatt year within the next five years

Bonneville Power Administration may have to raise its base rates from $17.50 to $20 or $21 a kilowatt year within the next five years. Moreover, despite a $1-billion federal construction program now underway, BPA predicted last week that the Pacific Northwest Pool area may run short of up to 800,000 kw of power within 10 years.

The possibility of a rate increase depends on several things:

1. Whether planned construction schedules on new BPA facilities are maintained for next few years, and

2. Whether Congress supplies the cash needed each year to carry on the work of these facilities.

This outlook comes from two BPA actions last week—rates schedules filed with Federal Power Commission and an annual outlook report.

Bonneville filed its proposed five-year rate schedules with FPC for approval. These contemplate no change in the present $17.50 base kw-year rates until at least the end of 1956. However, an adjustment clause in each rate schedule permits an increase in December of 1956, or in 1957 or 1958, if one becomes necessary to meet costs and to repay the federal government. Delay in construction or failure to get funds from Congress for one or more construction projects could cause the system to raise rates to avert a deficit.

Five years ago, Bonneville's administrator predicted a possible rate hike to $22.50, but this never became necessary. Perhaps this situation will repeat itself; but on the basis of what is known about construction to be completed in the next five to six years, any rate increase found necessary probably would hit the $20-to-$21 figure.

Gloomy Forecast . . . The gloomy forecast of a serious power shortage was written into Bonneville's report, "Advance Program, 1954." In it, the agency predicts that all firm power loads of the Northwest can be met through the next five to seven years, even under adverse weather conditions, but adds: "However, a serious and growing shortage faces the region by 1961-62 unless new generating plants are constructed." It set the possible deficiency at from 200,000 kw in 1961-62 to 800,000 in 1963-64, under minimium water conditions.

Bonneville also reports, however, that non-federal utilities in Washington, Oregon, Idaho, and western Montana now have under active consideration 33 projects with a potential capacity of about 5.4 million kw—far more than enough to offset the highest deficit figure presented in the BPA report, provided they were built. Included in these projects are proposed partnership projects such as Priest Rapids and John Day Dams, which have been authorized by Congress, but for which no cash has been supplied for the government share of construction. One of these projects alone—Libby Dam—could add 880,000 kw of prime power, BPA points out.

The Northwest Pool's resources are scheduled to be bolstered by some 4 million kw of hydro capacity during the next 8 years from McNary (700,000 kw); Chief Joseph (1,024,000 kw); The Dalles (1,119,000 kw); four smaller federal installations (Lookout Point, Dexter, Albeni Falls, and Chandler, totalling 184,000 kw); and non-federal projects. This expansion, according to Bonneville, will generally meet firm loads, but leave little margin for large industrial customers.

Potential Loads . . . Another point

made by BPA is that its estimates do not take into consideration potential loads of about 3 million kw for new electro-process industries that could be attracted to the region if sufficient power were known to be available.

When it takes these into account, the Administration predicts that power requirements in the west group of the pool will rise at a greater rate than in the nation as a whole during the 1953-63 decade. Loads, excluding new electro-process industries, are expected to rise from 29.5 billion kwhr in 1953 to 58 billion kwhr in 1963, or 7% a year. Adding potential requirements of electro-process industries, which now provide over 5% of total Pacific Northwest payrolls, the overall rate of growth would be 11% a year, rather than 7% Bonneville estimates.

This compares with Electrical World's most recent estimate that electric utilities requirements in the U. S. would go from 399 billion kwhr in 1952 to 878 billion in 1963, or about 7.5% yearly.

Should its anticipated substantial shortage materialize by 1963-64, sharp repercussions on the federal government's marketing policies would result, Bonneville warns. Initially, private utilities would suffer, and by the end of that period "practically all" the additional generation from federal plants now under construction would be absorbed by load growth of preference customers, the report explains. By that time, only 250,000 kw of federal prime power would be available to meet estimated privately owned utility requirements of 1.5 million kw under critical-year conditions.

FINANCIAL BRIEFS

Arizona Public Service Co has established an employee stock purchase plan. Deductions of not less than $4 nor more than 10% of the employee's monthly salary are turned over to a bank, which purchases common stock and holds it for the employees.

Middle South Utilities, Inc, has increased its quarterly dividend from 35¢ to 37½¢, payable Oct. 1.

Seattle City Council has given preliminary approval to a tax increase on gross revenues of City Light from the present 4% to 5%.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
Sept. 2	**2.87**	**2.91**	**3.11**	**3.93**	**4.07**	**4.40**	**4.51**	**4.87**	**5.15**
Aug. 26	2.86	2.90	3.11	3.95	4.06	4.42	4.47	4.83	5.09
END OF QTR.									
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.57	6.01

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Arkansas Power & Light	12	July	$6,480,569	$6,092,498	$...	$...
Detroit Edison	12	July	21,069,147	20,278,525	1.95(a)	1.92(a)
Iowa Southern Utilities	12	July	1,198,539	1,350,892	1.44(b)	1.93(b)
Louisiana Power & Light	12	July	3,682,338	3,463,636	....	....
Mississippi Power & Light	12	July	3,962,936	3,313,955	....	....
Montana Power, consolidated	12	July	7,563,438	7,901,044	2.64(c)	2.80(c)
Portland General Electric	12	July	4,066,300	3,651,652	1.37(f)	1.22(f)
Potomac Electric Power	12	June	6,449,660	6,119,715	1.18(g)	1.11(g)
Rockland Light & Power	5	May	925,070	669,498	.49(h)	.34(h)
Southern Indiana Gas & Electric	12	July	2,285,765	2,083,150	2.05(i)	2.09(i)
Tampa Electric	12	June	2,649,538	2,569,883	3.70(j)	3.57(j)

Notes—(a) Based on 10,778,843 shares in 1954 and 10,584,888 shares in 1953; (b) Based on 744,371 shares in 1954 and 623,205 shares in 1953; (c) Based on 2,481,665 shares, (f) Based on 3,000,000 shares in 1954 and 1953 in which the figures have been revised to give effect to the 2 for 1 stock split, effective at the close of business April 22, 1954; (g) Based on 5,117,040 shares now outstanding; (h) Based on present shares outstanding; (i) Based on 913,333 shares in 1954 and 799,167 shares in 1953; and (j) Based on 658,441 shares.

FINANCIAL

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF SEPTEMBER 2-8			
Bonds			
Los Angeles, Calif., Department of Water and Power—electric revenues due 1955-84	$19,500	various	0.65-2.50%
Montana-Dakota Utilities—1st mtg 3¼% due 1979	5,000	102.10%	3.375
Montana-Dakota Utilities—1st mtg 3⅜% due 1975	7,000	101.409	3.28
SCHEDULED FOR SEPTEMBER—OCTOBER			
Bonds and Debentures			**Bid Date**
Dayton Power & Light—1st mtg due 1984	$15,000	.....	Sept. 22
Northern States Power (Minn.)—1st mtg due 1984	20,000	.....	Sept. 28
Vineland, N. J.—electric plant due 1955-74	3,500	.....	Sept. 28
Western Massachusetts Electric—1st mtg due 1984	6,000	.....	Sept. 28
Columbus & Southern Ohio Electric—1st mtg due 1984	10,000	.....	Sept. 29
Public Service Co of Colorado—1st mtg due 1984	20,000	.....	Oct. 4
Indiana & Michigan Electric—1st mtg due 1984	16,500	.....	Oct. 5
Wisconsin Power & Light—1st mtg	18,000	.....	Oct. 6
Sierra Pacific Power—1st mtg	4,000	.....	Oct. 8
Texas Power & Light—1st mtg due 1984	20,000	.....	Oct. 18
Louisiana Power & Light—1st mtg due 1984	17,000	.....	Oct. 20
Savannah Electric & Power—1st mtg	5,000	.....	Oct. 26
Savannah Electric & Power—debs	3,000	.....	Oct. 26
Cleveland, Ohio—electric revenues	5,000	.....	.....
Preferred Stock			
Oklahoma Gas & Electric—75,000 sh $100 par	$7,500	.....	Sept. 14
Illinois Power—180,000 sh $50 par	9,000	.....	Sept. 15-16(a)
Tampa Electric—50,000 sh $100 par	5,000	.....	Sept. 22
Indiana & Michigan Electric—40,000 sh $100 par	4,000	.....	Oct. 5
Savannah Electric & Power—30,000 sh $100 par	3,000	.....	Oct. 26
Georgia Power—433,869 sh no par (to be offered in exchange for outstanding $6 pfd on a share-for-share basis, plus $5 in cash and accrued dividends)	.....	.....	.....
Common Stock			
Illinois Power—200,000 sh	.....	.....	Sept. 15-16(a)
Columbus & Southern Ohio Electric—200,000 sh $5 par	.....	.....	Sept. 21(b)
New England Electric System—910,833 sh $1 par (to be offered commonholders on a 1-for-10 basis, record Sept. 29)	.....	.....	Sept. 28
San Diego Gas & Electric—800,000 sh $10 par (to be offered commonholders on about 1-for-4 basis, record of Sept. 14)	.....	.....	.....
Sierra Pacific Power—34,807 sh (to be offered commonholders, record about Oct. 6 to expire Oct. 22)	.....	.....	.....
ISSUES RECENTLY POSTPONED			
Bonds			
Gulf States Utilities—1st mtg due 1984	$24,000	.....	.....
Consolidated Edison Co of N. Y.—1st mtg due 1984	50,000	.....	.....
Preferred Stock			
California Electric Power—105,000 sh $50 par	$5,250	.....	.....
Gulf States Utilities—160,000 sh $100 par	16,000	.....	.....

Notes—(a) Merrill Lynch, Pierce, Fenner & Beane and First Boston Corp. group, underwriters; (b) Dillon Read & Co. Inc, group, underwriters.

Connecticut Power Gets Rate Hike

• PUC grants a $1,138,884 yearly increase in residential rates as compared with $1,584,000 requested

• Order gives a 5.8% return on net original cost rate base

The Connecticut Public Utilities Commission granted the Connecticut Power Co a 17.2% increase in residential rates amounting to $1,138,884 in an order dated Aug. 18. The original filing by the company requested additional revenues of $1,584,000, or an increase of 24%. This increase was based on sales for the 12 months ended Dec. 31, 1954.

The commission, in its findings, stated that "the proposed increase in residential electric rates would be the first increase in rates for electric service in the history of the company."

In its discussion of the rate of return, the commission said, "The company is faced with the necessity of retiring presently outstanding bank loans and of attracting additional capital in order permanently to finance a construction program in which the company is engaged. At the end of 1955 the company's utility plant will have more than doubled since 1945."

The PUC order continued: "The company's debt ratio has increased from 48.5% in 1950 to 58.5% including bank loans in 1953 and by 1954, after the company incurs additional bank borrowings of some $5.5 million, the debt ratio, including bank loans, will be 62%. The company proposes to reduce this debt ratio in 1955 to 47%. Despite the temporary tax advantage which would result from high debt ratio, sound financing requires that the company's capitalization be more flexible than a high debt ratio permits."

Cannot Attract New Investors

The company contended that the present level of rates does not provide sufficient income to attract new investors on an economical basis. Company further claimed it should be allowed to earn at least 6.25% return on its rate base. PUC, in its determination of validity of company's claim, gave consideration almost entirely to cost of money.

In its findings, the PUC agreed with the company's witness that ". . . the cost for future borrowings will be about 3.25%, on which basis the composite interest rate on already outstanding long-term debt and new bonds will be about 3.05%."

The PUC noted that "the company has no preferred shares outstanding and the balance of its capital structure is composed of common capital stock and earned and capital surplus. Company witness emphasizes the relatively lower rate of earnings presently experienced and the high debt ratio prevailing for this company compared with the average for the electric utility industry of approximately 38%. It should be pointed out, however, that the electric utility industry generally has approximately 12% of its total capitalization in preferred shares which constitute a prior claim on earnings.

"Witness also emphasizes the relatively small size of this company and the fact that earned surplus account is equivalent to only 1.4% of the annual requirement for dividends on common stock while the average for the entire electric utility industry is 2.75% and for the ten other Triple A companies is 3.5%."

While the PUC conceded that the picture was unfavorable in some respects, it stated in its findings that ". . . the company's shares have enjoyed a low earnings price ratio for many years and even at the time of issuance of this finding, the price of the company's shares had reached a point where they were selling to yield approximately 5%. To what extent the market was discounting the effect of this commission's consideration of the company's request for high rates is difficult to estimate. It is sufficient to observe, however, that the company's shares have sold at a rate which compares favorably with **all electric utilities** (emphasis supplied) and at the time of the issuance of this finding compared favorably with the yield of stocks of **all electric utilities** (emphasis supplied) with stock in the hands of the public."

8.1% Return on Common Equity

The PUC continued—"After considering these various intangible factors, both favorable and unfavorable, we feel that an estimate of 5.5% is reasonable for the dividend market price ratio of the company's shares. Assuming a payout of 80%, which is higher than urged by the company but substantially below the company's actual experience for some years, and assuming a provision for cost of financing and underpricing of 15%, a fair measure for the rate at which the company could be expected to earn on the common equity proportion of its rate base should not exceed 8.1%."

"Combining the rate of earnings on long-term debt and on common capital stock plus surplus found reasonable above in the proportions at which both will be reported in the company's balance sheet after the financing program is completed in 1955, we find a fair cost of capital to the company will be approximately 5.72%.

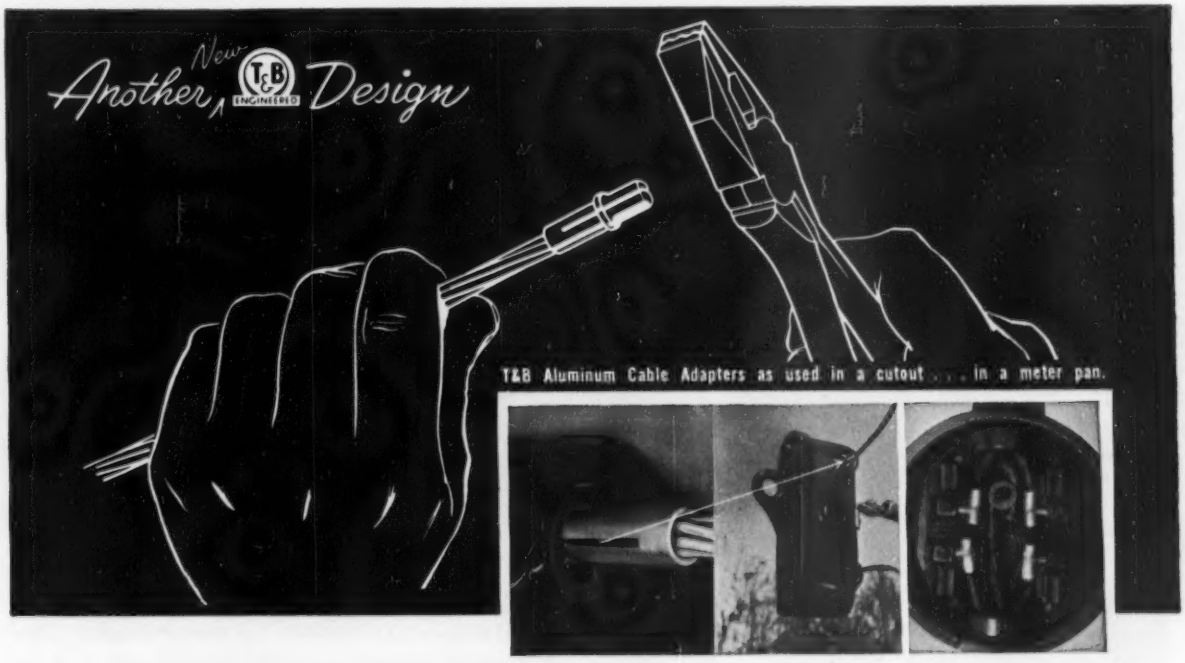
"Rates which provide a rate of return on rate base at least equal to 5.72% clearly cannot be said to be unreasonable. We find that a return of 5.8%, approximately, is reasonable and adequate to compensate the owners for the risks undertaken by them, to meet all interest and provide amply for any adverse effects not readily measurable by statistical means."

While PUC used net original cost of plant less plant acquisition adjustments and customers' contributions in determining the rate base, it is important to note, however, it allowed as cash working capital 45 days of operating expenses.

IF YOU'RE WIRING WITH ALUMINUM . . .

Utility Engineers are now installing aluminum cable in many places where only copper had been suitable. Equipment such as transformers, capacitors, cutouts, switches, and meter pans, having terminals designed for copper conductors, are now being wired to aluminum and A.C.S.R. with little or no difficulty.

How? T&B's new Aluminum Cable Adapters. They're made of heavily-tinned copper alloy; take up little more space than the cable; install in a jiffy. A lineman or electrician merely taps one onto the end of the conductor, then clamps the adapter as though it were copper conductor. "Straight" and "flag" types are available. The flag type is best for connections at right angles to cable outlets.



One of the outstanding features of these new adapters is the serrated bore. As the adapter is tapped onto the cable, the serrations bite through the aluminum oxide coating. The high-conductivity connection thus formed is maintained, despite weather and moisture, by an oxide inhibitor precoated in the bore. The clamp end is slotted and spring-like to maintain pressure during thermal expansion and contraction.

These versatile Cable Adapters are opening up many new applications for aluminum cable. Sizes for cable up to #2 Str. at present. If you're wiring with aluminum, you might possibly have a unique application. If so, let us know about it. We'll be glad to send you a free sample of the adapter and descriptive literature. Write to The Thomas & Betts Co. today.

Note how the bore serrations have scraped through the oxide coating on the cable end.

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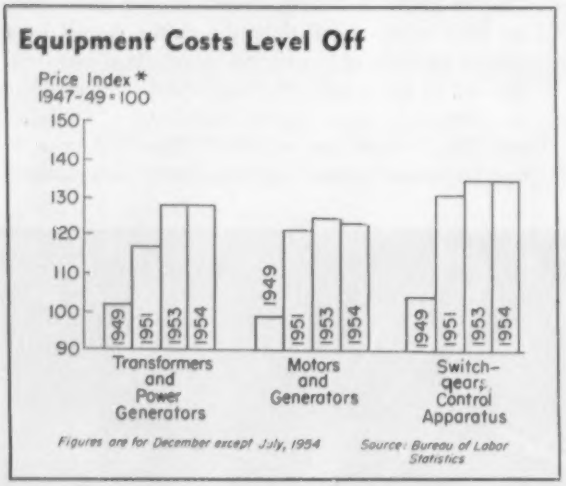
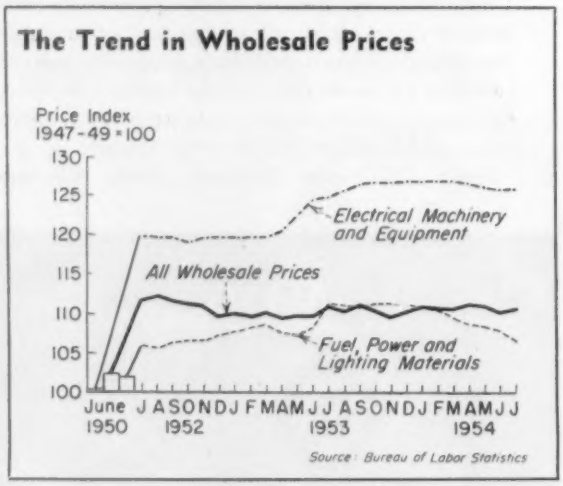
ELECTRICAL BUSINESS OUTLOOK





Not Much Change Seen in Expansion Costs

The costs of expanding have leveled off for electrical utilities, as expected (EBO, Feb. 15, 1954). Cost of major equipment has hardly changed in the past half-year. Construction costs have not changed much. And the cost of borrowing money, while it has fluctuated, has stayed within fairly narrow limits—well below the level of last year.

The post-Korea inflation was climaxed—for utilities—in early 1953. Equipment and construction costs shot up sharply. And the cost of borrowing money to pay for them rode the escalator of the Administration's "hard money" policy to the highest point in many years. It's not hard to see why the cost trend altered. A quick change of heart in Washington took care of the cost of money—and the recession took care of the rest.

Not Much Change in Costs Ahead . . . What's the prospect for expansion costs over the next year? The key element in the answer is the outlook for business—and especially the outlook for demand for electrical equipment. Right now, there's little prospect of much change in either. And that prospect leads to two conclusions:

1. Any prices that do go up won't go up much. It's hard to raise prices in the face of heavy competition in a market that's not expanding. And that, for the time being, is the situation in the United States economy.
2. The cost of money won't go up much, and it may decline some more from present levels. The chief reason is simply that Washington, which largely controls money cost, will keep money cheap.

The cost of living is another factor that's helping to hold prices in line. The cost of living, according to the Bureau of Labor Statistics, was exactly the same in July as it was last January. And that stability removes one source of union pressure for sharply higher wages—which, in turn, frequently show up in sharply higher prices.

All these factors—strong competition, business recession, politics, cost of living—argue for stable or even reduced prices of the equipment utilities buy. But balanced against them is one force that is going to be hard to overcome in the long run. That's the fact that wage costs of makers of electrical equipment are still rising although not so fast as before.

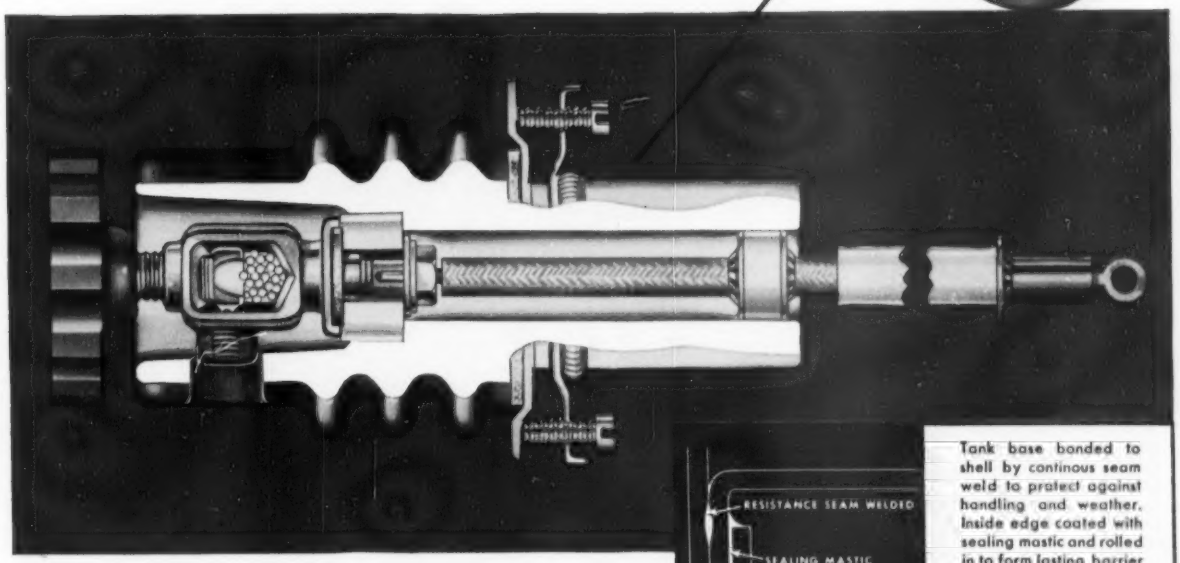
It's an extraordinary fact that wages can go up in the United States even when there has been a recession. They have gone up this year. And this rise puts a squeeze on the profits of manufacturers. They have also had to pay higher prices for some materials.

Rising wages have not increased equipment costs so far for several additional reasons. One is that profits have been buttressed by the demise of the excess profits tax. Another is that companies have been able to eliminate overtime. And the cost of some materials has dropped as oversupply replaced scarcity. But these offsets to rising costs are not going to be around forever; so the pressure for higher prices will get more severe as time goes on.

Price Trends Are Important . . . The other chart above illustrates some price trends that are important for companies in the electrical business. As it shows, prices of electrical equipment have risen much farther than average wholesale prices since June, 1950. And these prices are still close to their peak. On the other hand, fuel, power, and lighting materials never rose as high, and they are well below their peak. Coal and petroleum are down because of the pressure of large competitive supplies.

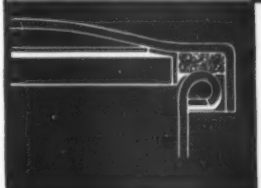
These figures and others from the Bureau of Labor Statistics' Wholesale Price Index could be used more than they are in business planning. BLS collects prices on a wide range of products and publishes indexes that show the trends in the nation-wide average costs of many products.

FEATURED PERFORMER



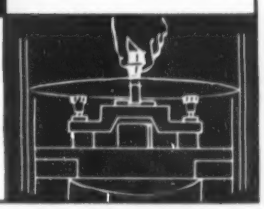
Tank base bonded to shell by continous seam weld to protect against handling and weather. Inside edge coated with sealing mastic and rolled in to form lasting barrier against moisture, air and rust.

Low voltage bushings keyed to fit into notched hole in tank wall, thus lineman, tightening connections cannot rotate bushing, eliminating danger of accidential contact between "hot" lines.



Corprene gasket retained by ring welded to tank cover. Gasket is retained in position forming a perfect tank seal. Gasket is not cemented and can be used again and again.

Tap changer operating handle located above hot oil level. Double-moving contacts snap into position with a wiping action to assure positive contact.



Moloney HiperCore Distribution Transformers possess mechanical features to insure the excellent performance and longer, trouble-free operating life that you expect of Moloney Products.

Sidewall mounted high voltage bushings of rugged design to stand the "gaff" so necessary for utility service will accomodate solid or stranded conductors in all standard sizes. "V" shaped clamping surfaces insure better contact with maximum cable contact surface. Easy entry from either side through tapered openings permit easier installations with less hazard to the lineman. Tightening knob of molded phenolic-cold rubber enables workmen to work "Hot".

M454-53

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Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

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Don't Let Poor Voltage Cut System Profits!

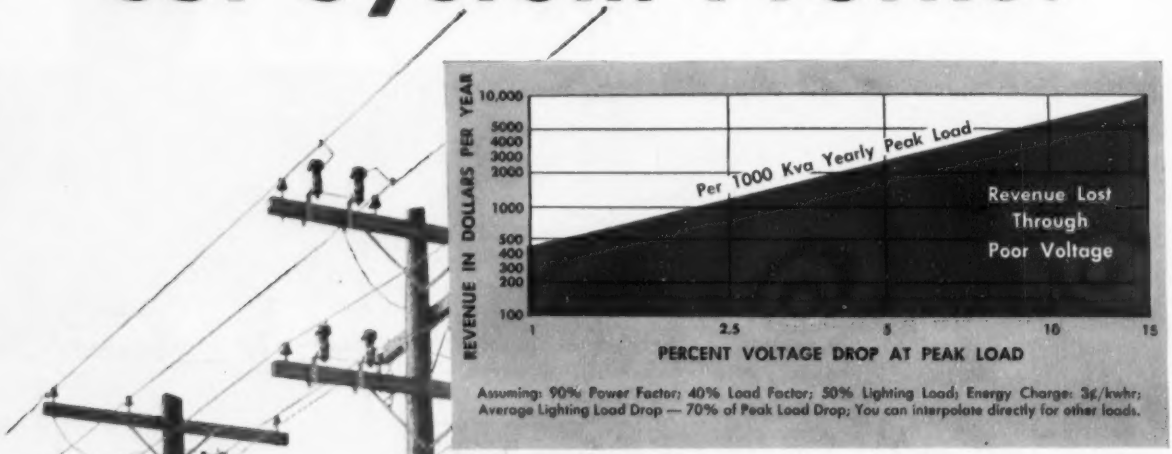
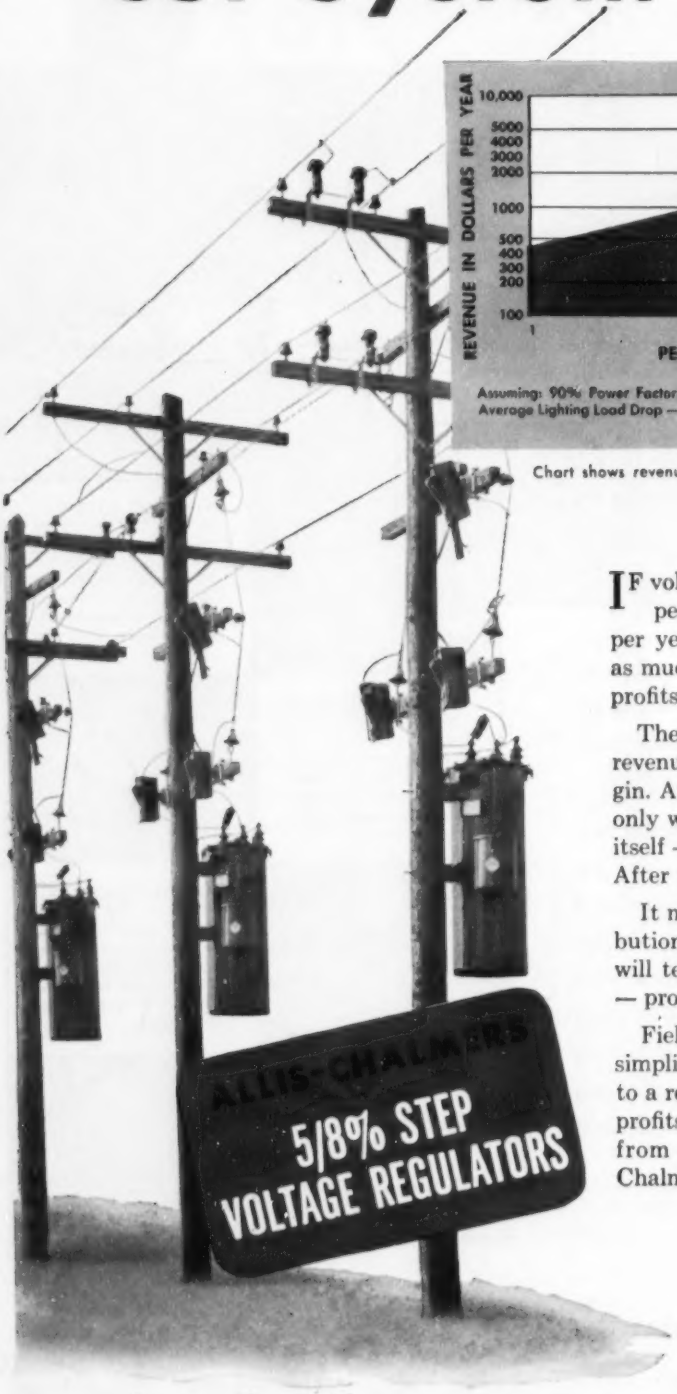


Chart shows revenue losses when voltage is poor on a typical distribution line.



IF voltage is only 2.5% low on a 1000-kva yearly peak load, your system loses as much as $600 per year. Ten percent low voltage means loss of as much as $4500 in revenue. It's a direct loss in profits when your voltage isn't right.

There's an easy-to-install way to get this lost revenue back where it belongs—in the profit margin. An Allis-Chalmers distribution regulator not only will provide accurate voltage, it will pay for itself — in less than two years in many instances. After that, all revenue increases are pure profit.

It makes sense to choose Allis-Chalmers distribution regulators. Hundreds of distribution men will tell you about their accuracy and reliability — proved in twenty years of operation.

Field-proved design, rugged construction and simplified installation and maintenance add up to a regulator that can turn lost revenue into real profits for your system. Get more information from your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4416

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